ON THE

SCIENCE OF PROPORTIONS.

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ON THE

SCIENCE OF THOSE PROPORTIONS

BY WHICH THE

HUMAN HEAD AND COUNTENANCE

AS REPRESENTED IN WORKS OF

ANCIENT GREEK ART

ARE DISTINGUISHED FROM THOSE OF ORDINARY

NATURE.

BY

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AUTHOR OF "FIRST PRINCIPLES OF SYMMETRICAL BEAUTY,"

ETC. ETC. ETC.

WILLIAM BLACKWOOD AND SONS,

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TO

THE HONOURABLE

LORD MURRAY,

ONE OF THE JUDGES OF THE COURT OF SESSION OF SCOTLAND,

F.R.S.E., ETC. ETC. ETC.

THIS WORK IS DEDICATED, AS A TESTIMONY OF THE

GRATITUDE, ESTEEM, AND RESPECT,

OF

THE AUTHOR.

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PREFACE.

THE recommendation of Sir Joshua Reynolds, that "every opportunity should be taken to discountenance the false and vulgar opinion, that rules are the fetters of genius," ought never to be lost sight of by those who treat of the arts of design. Such an idea is scarcely less prevalent in our own day than it was when our great English painter wrote, notwithstanding the practical refutation it receives in the obedience yielded by genius to the rules of rhythmical measure, even in the highest flights of poetic inspiration, or in the delicate creations of the musical composer, in subjection to the strictly defined laws of harmony.

By an implicit obedience to the application of these definite rules, genius has clothed the creations of fancy in

poetic numbers, or given form and expression to the most exquisite combinations of musical sound, thereby charming the ear, and entrancing the soul, of the most intelligent and critical student of art, through that inherent principle in the human mind that responds in unison to every species of harmony.

But while the poet and the musician are thus acknowledged as the willing subjects of well-defined harmonic laws, it has been hastily and most inconsistently assumed, that, when genius seeks to give expression to its conceptions in the formative arts, it is folly to imagine that any well-defined laws can be demonstrated, whose bounds shall guide their development, or supply safe canons for the critic's guidance.

It will be shown in the following pages, however, that the laws of proportion, in their relation to the arts of design, constitute the harmony of geometry as definitely as those that are applicable to poetry and music produce the harmony of acoustics; and that, consequently, the former ought to hold the same relative position in those arts which

are addressed to the eye that is accorded to the latter in those which are addressed to the ear. Until so much science be brought to bear upon the formative arts, the student must continue to copy from individual and imperfect nature, or from the few existing remains of ancient Greek art, while he remains altogether ignorant of the laws by which their proportions are produced; and, what is equally detrimental to art, the accuracy of all criticism must continue to rest upon the indefinite and variable basis of mere opinion.

It cannot be denied that men of great genius in the formative arts are generally possessed of an intuitive feeling of appreciation for what is beautiful in form, by means of which they impart to their works the most pleasing proportions, independently of any knowledge of the definite laws which govern that species of beauty; yet even they often do so at the expense of much labour, making many trials before they can satisfy themselves in imparting to them true proportions, along with those other qualities of expression, action, &c., that belong more exclusively to the

province of genius. To such, an application of the rules which constitute the science of proportion, instead of fettering their genius, would doubtless promote the more free exercise of its powers, and give such confidence and precision to their exercise as no mere mental perception of the harmony and beauty of form can produce.

It is also true that the operations of the conceptive faculty of the mind are uncontrolled by definite laws, and that, therefore, there cannot exist any rules, by the inculcation of which an ordinary mind can be imbued with genius sufficient to produce works of high art. Nevertheless, such a mind may be improved in its perceptive faculty by instruction in the science of proportion, so as to be enabled to exercise as correct and just an appreciation of the conceptions of others, in works of formative art, as that manifested by the educated portion of mankind in respect to poetry and music. In short, it appears that, in those arts that are addressed to the ear, men of genius communicate the original conceptions of their minds under the control of certain scientific laws, by means of which the educated

easily distinguish the true from the false, and by which the works of the poet and musician may be placed above mere imitations of nature, or of the works of others; while, in those arts that are addressed to the eye, such as sculpture, architecture, painting, and ornamental design, no such laws are as yet acknowledged.

In the following pages, the author endeavours to demonstrate such definite laws of proportion. In making this attempt, he has here confined himself to their illustration in relation to artistic representations of the human head and countenance, having already, in other works, shown their application in architecture, not only to general proportions, but to the minutest details, and in ornamental design to the production of an endless variety of beautiful forms of ornamental vases, and of every species of utensil pertaining to the arts of the ornamental sculptor, the silversmith, and the potter.

Some apology may appear requisite for the unartistic execution of the heads which are added to the geometrical illustrations of this treatise. The author is well aware that

they would have been greatly enhanced in effect by artistic assistance in drawing them; but he conceived that, as these illustrations are added to the diagrams and skulls merely to show how far the science of proportion is productive of beauty in representations of the human head and countenance, independently of those qualities which genius only can impart, this object would be sufficiently attained by drawing them with his own hand, confining himself simply to what in architecture would be termed geometrical elevations in outline. He also trusts that the anatomist will look with no critical eye upon his unprofessional attempts to delineate the bones of the head, in accommodating them to his geometrical figures.

JORDAN BANK, EDINBURGH,
December, 1848.

ON THE

SCIENCE OF PROPORTIONS.

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PART I.

DEFINITION OF ÆSTHETICS.

Before entering upon the subject which it is the chief design of this treatise to elucidate, it may be desirable to give some definition of the science of Æsthetics, of which proportion is the principal element. Dealing, as this science does, alike with the sources and the resulting principles of beauty, it does not belong exclusively either to the physical or metaphysical sciences. It is scarcely less dependent on the accuracy of the senses than on the power of the understanding, inasmuch as the effect which it produces is as essential a property of objects, as are its laws inherent in the human mind. It comprehends a knowledge of those first principles in the arts of design, by which certain combinations of forms and colours

produce an effect upon the mind, connected, in the first instance, with sensation, and, in the second, with the reasoning faculty. It is, therefore, not only the basis of all true practice in art, but of all sound judgment on questions of artistic criticism, and necessarily includes those laws whereon a correct taste must be based.

Many eloquent and ingenious treatises have been written upon taste, but in nearly every case, with no other effect than that of involving the subject in still greater uncertainty. Even when restricted to the arts of design, they have failed to exhibit any definite principles whereby the true may be distinguished from the false, and some recognised laws of beauty reduced to demonstration. This may be attributed, in a great degree, to the neglect of a just discrimination between what is merely agreeable, or capable of exciting pleasurable sensations, and what is essentially beautiful; but still more to the confounding of the operations of the understanding with those of the imagination. Very slight reflection must suffice to show how essentially distinct these two faculties of the mind are; the former being regulated, in matters of taste, by irrefragable principles existing in nature, and responded to by an inherent quality of the human mind; while the latter operates in the production of ideal combinations of its own creation, in the region of fancy, altogether independent of any immediate impression from external nature.

The beauty of a flower, for example, or of a dew-drop, depends on certain combinations of form and colour, manifestly referrible to

definite and systematic, though it may be as yet unrecognised, laws; but when Oberon exclaims, in "Midsummer Night's Dream,"—

> "And that same dew, which sometime on the buds
> Was wont to swell, like round and orient pearls,
> Stood now within the pretty flow'ret's eyes,
> Like tears that did their own disgrace bewail,"—

here the poet introduces a new element of beauty, equally legitimate, yet altogether distinct from that which constitutes the science of Æsthetics, as here defined. It is the element of fancy, reducible to no rule, yet adding fresh combinations of beauty, and a distinct source of pleasure to the mind.

Our physical and mental powers may be classed under three heads, in their relation to the arts of design, viz., the *perceptive*, the *receptive*, and the *conceptive*.

The human eye, from the exquisite beauty of its structure, and the intelligence displayed in its adaptation, is receptive of correct impressions from the action of light, according to the innumerable degrees and modes in which the optical phenomena operate upon it. These impressions are conveyed to the sensorium by the optic nerve, and of such the mind is perceptive. This perception induces an operation of the understanding, or is itself an act of the mind, whereby it appreciates the nature and quality of the impression originally made on the receptive organ. The mode of this operation is intuitive, and its

degree, in regard to accuracy, is regulated by the intellectual vigour of the individual. The intuitive power of the understanding thus enables us to decide correctly as to proportion or deformity; but when it is improved by cultivating and extending our knowledge, we can investigate the causes of beauty, and assign reasons for our judgment in matters of taste. These causes and effects constitute the laws of Æsthetics.

The conceptive power of the mind is that faculty by which original ideas are formed with the assistance of memory, in combining what has already been operated on by the intermediate powers of perception. This constitutes genius. These various powers, which form the chain between the material and intellectual worlds, are so beautifully interwoven, that it is difficult to assign to them their respective limits, and the examination of each varied link of this chain adds to the difficulty, from the closeness of their affinities and relations.

Reception thus appears to be simply the physical effect produced upon the mind by direct, transmitted, or reflected light, through the eye; perception, the operation of the mind by which this impression is appreciated or understood, whether as to its power, in being more or less strong upon the organ—its kind, in being simple or mixed—its nature, in being gay or sombre—or its quality, in being harmonious or discordant; but conception is the power of constructing original ideas from these materials. The understanding operates, in the first instance, in establishing facts, and then the judgment is formed upon

these operations by the reasoning powers, which lead, in their turn, to the creations of the imagination.

When an impression is received and perceived, in the fullest sense of the word, the understanding of such an impression, or the manner in which the mind comprehends its nature and qualities, depends upon the mental powers and education of the individual, of the modifications of the former of which there are as many varieties as there are of countenances amongst mankind. But when we conceive an impression, it is by reasoning upon others previously perceived; for we cannot conceive anything unless it resemble, or, at all events, bear some analogy to an impression already perceived. Memory supplies the materials for conceptions of the mind, and, probably, the only materials; but memory has received its stores from the perceptive faculty, which contributes to it the result of the first impressions on the organs of sense, as felt, understood, and comprehended by the faculty of perception.

In the science of Æsthetics, therefore, the human mind is the subject, and external nature the object. Each individual mind may be considered as a monad in creation—a world within itself. These two separate existences—the individual mind and so much of creation as lies within the scope of its powers—have a distinct relation to each other: the subject is affected by the object, and the media of communication are the sensorium and its inlets, the organs of sense—the former being in direct contact with the subject, and the latter with the

object. The organs of sense are thus acted upon in various ways, agreeably to the numerous modifications of the elements of the external world, but æsthetically the mind is affected in two ways only. These affections are either pleasing or displeasing, in so far as they may be in harmony with, or discordant to, a mathematical principle which, in various degrees, exists in the human mind, and by which the truly beautiful is distinguished from the merely agreeable.

Note A. The receptive and perceptive powers may be improved by tuition and practice; and this is called Æsthetic culture. But the conceptive or creative power is intuitive, and when developed in a high degree constitutes true genius. The exercise of this power may be assisted by Æsthetic culture, but the power itself cannot be improved by any mode of tuition.

Having thus briefly endeavoured to define Æsthetic science, and to show that it ought to form the basis of all instruction in art, I shall now proceed to inquire into the mode in which it is cultivated at the present period, with a view to improve the practice of art and the appreciation of its productions, as compared with what we know of the mode in which it was inculcated in Greece at the period when art had arrived at its highest excellence, and was most correctly appreciated by the people.

PART II.

ON ÆSTHETIC CULTURE.

Truth in the sciences has of late been sought, by tracing nature to her most simple elements and first principles of action and combination. By this means natural philosophy has attained its present advanced state; and by the application of this knowledge, in the useful arts, the happiest results have been produced. But in our search for truth in Æsthetic science, a course has been followed not differing widely from that by which the alchymists of the middle ages conducted their investigations; for our ideas of visible beauty are still undefined, and our attempts to produce it in the various branches of art are left dependent in a great measure upon chance. Our schools instituted for instruction in the arts of design, are conducted without reference to any first principles, or definite laws of beauty; and, from the drawing of a simple architectural moulding to the intricate combinations of form in the human figure, the pupils have to depend

upon their hands and eyes alone, servilely and mechanically copying the works of the ancients, instead of being instructed in the principles upon which the beauty of those works depends. The instruction given in these schools is addressed almost exclusively to the senses, without reference to the judgment or understanding of the pupils; and they are thus made to study and imitate effects without investigating causes. Doubtless, men of great genius sometimes arrive at excellence in the arts of design without a knowledge of the principles upon which beauty of form is based; but it should be kept in mind, that true genius generally includes an intuitive perception of those principles along with its creative power. It is, therefore, to the generality of mankind that instruction in the definable laws of beauty will be of most service, not only in improving the practice of those who follow the arts professionally, but in enabling all to distinguish the true from the false, and to exercise a sound and discriminating taste in judging of artistical productions. Æsthetic culture should, therefore, supersede servile copying as the basis of instruction in our schools of art. But it has been asserted that, by copying the great works of the ancients, the mind of the pupil will become imbued with ideas similar to theirs—that he will imbibe their feeling for the beautiful, and that, consequently, he will become inspired with their genius, and think as they thought. We, however, see very few satisfactory works of art resulting from this imaginary process in the minds of the pupils; and, indeed, it would be as unreasonable to suppose that the poetry of art

is to be acquired by such means, as it would be to imagine that poetic inspiration could be created by setting boys to transcribe the works of the ancient poets. Sir Joshua Reynolds considers copying as a delusive kind of industry, and observes that "Nature herself is not to be too closely copied. There are excellencies in the art of painting beyond what is commonly called the imitation of nature. * * * A mere copier of nature can never produce anything great." And in support of these views he quotes Proclus (Lib. II., *in Timæum Platonis*, as cited by Junius, *De Picturâ Veterum*), who says—"He who takes for his model such forms as nature produces, and confines himself to an exact imitation of these, will never attain to what is perfectly beautiful. For the works of nature are full of disproportion, and fall very short of the true standard of beauty."

It is remarked by Mr J. C. Daniel, in the Introduction to his translation of M. Victor Cousin's *Philosophy of the Beautiful*, that "the English writers have advocated no theory which allows the beautiful to be universal and absolute; nor have they professedly founded their views on original and ultimate principles. Thus, the doctrine of the English school has for the most part been, that beauty is mutable and special, and the inference that has been drawn from this teaching is, that all tastes are equally just, provided that each man speaks of what he feels." He then observes, that the German and some of the French writers have thought far differently; for with them the beautiful is "simple, immutable, absolute, though its *forms*

are manifold." These observations are quite true as regards the works of Hume, Burke, and Alison; but these authors, although the most popular, were not our only writers on taste. So far back as the year 1725, the same truths advanced by the modern German and French writers, and so eloquently illustrated by M. Cousin, were given to the world in an anonymous publication, entitled, "An Note B. Inquiry into the Original of our Ideas of Beauty and Virtue." This author says—"We, by absolute beauty, understand only that beauty which we perceive in objects, without comparison to any thing external, of which the object is supposed an imitation or picture, such as the beauty perceived from the works of nature, artificial forms, figures, theorems. Comparative or relative beauty is that which we perceive in objects commonly considered as imitations or resemblances of something else."

Dr Reid also, in his *Intellectual Powers of Man*,* says, "That taste which we may call rational, is that part of our constitution by which we are made to receive pleasure from the contemplation of what we conceive to be excellent in its kind, the pleasure being annexed to this judgment, and regulated by it. This taste may be true or false, according as it is founded on a true or false judgment. And if it may be true or false, it must have first principles."

M. Victor Cousin's opinion upon this subject is, however, still more

* Chap. vi., p. 442.

conclusive. He observes—"If the idea of the beautiful is not absolute, like the idea of the true—if it is nothing more than the expression of individual sentiment, the rebound of a changing sensation, or the result of each person's fancy—then the discussions on the fine arts waver without support, and will never end. For a theory of the fine arts to be possible, there must be something absolute in beauty, just as there must be something absolute in the idea of goodness, to render morals a possible science."*

That there are fixed principles which form the basis of Æsthetic science, is now very generally admitted; and when these principles are evolved with the same care which has characterized the labours of investigators in natural science, and are applied in the fine arts as the natural sciences have been in the useful arts, a solid foundation will then be laid not only for correct practice, but also for a just appreciation of productions in every branch of the arts of design.

In reference to the application of scientific truth as the basis of artistic canons in art, Sir David Brewster justly says—"It is in the fine arts principally, and in the speculations with which they are associated, that the controlling power of scientific truth has not exercised its legitimate influence. In discussing the principles of painting, sculpture, architecture, and landscape gardening, philosophers have renounced science as a guide, and even as an auxiliary; and a school

* *Philosophy of the Beautiful*, &c. London: W. Pickering.

has arisen whose speculations will brook no restraint, and whose decisions stand in opposition to the strongest convictions of our senses. That the external world, in its gay colours and lovely forms, is exhibited to the mind only as a tinted mass, neither within nor without the eye, neither touching it nor distant from it—an ubiquitous chaos which experience only can analyze, and touch transform into the realities which compose it; that the beautiful and sublime in nature and in art derive their power over the mind from association alone—are among the philosophical doctrines of the present day, which, if it be safe, it is scarcely prudent to question. Nor are these opinions the emanations of poetical or ill-trained minds, which ingenuity has elaborated and which fashion sustains. They have been given to the world with all the authority of demonstrated truth; and in proportion to the hold which they have taken of the public mind, have they operated as a check upon the progress of knowledge."*

I shall now revert to that remote period when the arts of design had attained a height which succeeding ages have in vain attempted to reach, and by this means endeavour to ascertain the nature of the doctrines then inculcated in connection with art. That the principles of art, as well as of science, were taught in the early schools of Greek philosophy, is admitted by almost all writers on the subject; and it is recorded of Pythagoras, that, on his return from his travels in search

* *Edinburgh Review*, vol. lxxviii., pp. 300, 301.

of knowledge amongst the Phœnicians, Egyptians, and Chaldeans, about 520 years before the Christian era, he exhibited to his disciples and pupils, amongst other discoveries and improvements, a system of analogy, or key, for finding all harmonious proportions in painting, sculpture, architecture, and music; and that it was by the help of this analogical principle that the Grecians excelled all other nations in the arts of architecture, sculpture, and painting; and that, after the conquest of Greece by the Romans, the Grecian artists employed at Rome kept this principle a profound secret amongst themselves.

This I find quoted by Hogarth, in the Preface to his "Analysis of Beauty," upon the authority of a writer of the period called Christopher Le Blon; and although I have not been able to discover so definite a statement of a system of harmonious proportion borne out by other writers upon the Pythagorean doctrines, yet I find sufficient to render it highly probable that the principles included in this analogy, which the Greeks certainly employed in the arts, emanated from the school of Pythagoras.

These principles, in addition to the uncertainty of their origin, seem for many centuries to have been buried in oblivion. It becomes, therefore, requisite to endeavour to arrive at some knowledge of their nature, in order that we may see in what respects they were connected with the known doctrines of Pythagoras.

It is well known, that in the time of that great philosopher the treasures of science were veiled in mystery to all but the properly

initiated, and the results of its various branches only given to the world in works of art by those who had acquired this knowledge. So strictly was this secrecy maintained amongst the disciples and pupils of Pythagoras, that any one divulging the sacred doctrines to the profane was expelled the community, and none of his former associates allowed to hold further intercourse with him: it is even said, that one of his pupils incurred the displeasure of the philosopher for having published the solution of a problem in geometry.* The difficulty, therefore, which is expressed by writers, shortly after the period in which Pythagoras lived, regarding a precise knowledge of his theories, is not to be wondered at, more especially when it is considered that he never committed them to writing. It would appear, however, that he proceeded upon the principle, that the order and beauty so apparent throughout the whole universe must compel men to believe in, and to refer them to, an intelligent cause. To this Supreme Intelligence, or active principle, the name of monad, or unity, was given, because it must be always the same; to matter, or the passive principle, was given that of dyad, or multiplicity, because it is subject to every kind of change;† and to the world itself was given that of triad, since it was the result of intelligence and matter. Pythagoras and his disciples sought for properties in the science of numbers, by the knowledge of which they might attain to that of nature; and they conceived

* Abbè Barthélémie's *Travels of Anacharsis in Greece*, vol. iv., pp. 193, 195.

† Or, more probably, because it was subject to two states only, viz., those of chaos and order.

those properties to be indicated in the phenomena of sonorous bodies Observing that Nature herself had thus irrevocably fixed the numerical value of the intervals of musical tones, they justly concluded that, as she is always uniform in her works, the same laws must regulate the general system of the universe.* Pythagoras, therefore, considered numerical proportion as the great principle inherent in all things, and traced the various forms and phenomena of the world to numbers as their basis and essence.

How the principles of numbers were applied in the arts is not recorded, farther than what transpires in the works of Plato, whose doctrines were from the school of Pythagoras. In explaining the principle of beauty, as developed in the elements of the material world, he commences in the following words:—"But when the Artificer began to adorn the universe, he first of all figured with forms and numbers, fire and earth, water and air; which possessed, indeed, certain traces of the true elements, but were in every respect so constituted, as it becomes anything to be from which Deity is absent. But we should always persevere in asserting that Divinity rendered them as much as possible the most beautiful and the best, when they were in a state of existence opposite to such a condition." Plato goes on farther to say, that these elementary bodies must have forms; and as

* Abbè Barthélémie (vol. ii., pp. 168, 169), who cites as his authorities, Cicer. *De Nat. Deor.*, Lib. I., cap. ii., t. 2, p. 405; Justin Mart., *Orat. ad Gent.*, p. 10; Aristot. *Metaph.*, Lib. I., cap. v., t. 2, p. 845.

it is necessary that every depth should comprehend the nature of a plane, and as of plane figures the triangle is the most elementary, he adopts two triangles as the originals or representatives of the isosceles and the scalene kinds. The first triangle of Plato is that which forms the half of the square, which is regulated by the number 2; and the second that which forms the half of the equilateral triangle, which is regulated by the number 3: from various combinations of these he formed the bodies of which he considered the elements to be composed. To these elementary figures I shall have again to refer.

Vitruvius, who studied architecture many ages after the arts of Greece had been buried in the oblivion which succeeded her conquest, gives the measurements of various details of monuments of Greek art then existing. But he seems to have had but a vague traditionary knowledge of the principle of harmony and proportion from which these measurements resulted. He says—"The several parts which constitute a temple ought to be subject to the laws of symmetry; the principles of which should be familiar to all who profess the science of architecture. Symmetry results from proportion, which, in the Greek language, is termed analogy. Proportion is the commensuration of the various constituent parts with the whole; in the existence of which symmetry is found to consist. For no building can possess the attributes of composition in which symmetry and proportion are disregarded; nor unless there exist that perfect conformation of parts which may be observed in a well formed human being." After going

at some length into details, he adds—"Since, therefore, the human figure appears to have been formed with such propriety, and that the several members are commensurate with the whole, the artists of antiquity" (meaning those of Greece at the period of her highest refinement) "must be allowed to have followed the dictates of a judgment the most rational, when, transferring to the works of art principles derived from nature, every part was so regulated as to bear a just proportion to the whole. Now, although *these principles were universally acted upon*, yet they were more particularly attended to in the construction of temples and sacred edifices, the beauties or defects of which were destined to remain as a perpetual testimony of their skill or of their inability."

Vitruvius, however, gives no explanation of this ancient principle of proportion, as derived from the human form; but plainly shows his uncertainty upon the subject, by concluding this part of his essay in the following words:—"If it be true, therefore, that the decenary notation was suggested by the members of man, and that the laws of proportion arose from the relative measures existing between certain parts of each member and the whole body, it will follow, that those are entitled to our commendation who, in building temples to their deities, proportioned the edifices, so that the several parts of them might be commensurate with the whole."

It thus appears certain, that the Grecians at the period of their highest excellence had arrived at a knowledge of some definite

mathematical law of proportion, which formed a standard of perfectly symmetrical beauty, not only in the representation of the human figure in sculpture and painting, but in all other works of art in which beauty of form constituted an excellence. That this law was not deduced from the proportions of the human figure, as supposed by Vitruvius, but had its origin in mathematical science, seems equally certain; for in no other way can we satisfactorily account for the *beau idéal* head of ancient Greek art, or the inimitable proportions of the Parthenon at Athens, far less for the general beauty of form that pervades all other works of art of the period with which we are acquainted.

This system of geometrical harmony, founded upon numerical relations, must, consequently, have formed part of the Greek philosophy of the period, by means of which the arts began to progress towards that great excellence which they soon after attained. A little farther investigation will show, that immediately after this period a theory connected with art was acknowledged and taught, and, also, that there existed a Science of Proportion.

Pamphilus, the celebrated painter, who flourished about four hundred years before the Christian era, from whom Apelles received the rudiments of his art, and whose school was distinguished for scientific cultivation, artistic knowledge, and the greatest accuracy in drawing, would admit no pupil unacquainted with geometry.* The

* Müller's *Ancient Art and its Remains.*

terms upon which he engaged with his students were, that each should pay him one talent (£225 sterling) previous to receiving his instructions: for this he engaged "to give them, for ten years, LESSONS FOUNDED ON AN EXCELLENT THEORY."*

It was by the advice of Pamphilus that the magistrates of Sicyon ordained that the study of drawing should constitute part of the education of the citizens—"a law," says the Abbè Barthélémie, "which rescued the fine arts from servile hands."

It is stated of Parrhasius, the rival of Zeuxis, who flourished about the same period as Pamphilus, that he accelerated the progress of art by purity and correctness of design; "for he was acquainted with the SCIENCE OF PROPORTIONS. Those he gave his Gods and Heroes were so happy, that artists did not hesitate to adopt them." Parrhasius, it is also stated, was the first who gave "expressive airs of heads, mouths embellished by the graces, and hair pourtrayed with delicacy." He was so admired by his contemporaries, that they decreed him the name of Legislator.† The whole history of the arts in Egypt and Greece concurs to prove that they were based on geometric precision, and were perfected by a continued application of the same science; while in all other countries we find them originating in rude and misshapen imitations of nature.

* *Anacharsis' Travels in Greece.* By the Abbè Barthélémie. Vol. ii., p. 325.

† Ibid, vi, p. 225. The authorities the Abbè quotes are—Quintil., Lib. XII., cap. x., p. 744; Plin., Lib. XXXV, cap. ix., p. 691.

In the earliest stages of Greek art, the gods—then the only statues—were represented in a tranquil and fixed posture, with the features exhibiting a stiff, inflexible earnestness, their only claim to excellence being symmetrical proportion; and this attention to geometric precision continued as art advanced towards its culminating point, and was thereafter still exhibited in the neatly and regularly folded drapery, and in the curiously braided and symmetrically arranged hair.*

These examples, few and imperfect as they are, cannot fail to exhibit the great contrast that exists between the system of elementary education in art practised in ancient Greece, and that adopted
Note C. in this country at the present period. But it would be of very little service to point out this contrast, were it not followed up by some attempt to develop the principles which seem to have formed the excellence of the Grecian system. This attempt, therefore, constitutes the chief object in what follows; while along with it I shall also endeavour to apply those principles practically in the reconstruction of the artistic head of ancient Grecian art.

* Müller's *Archæology of Art, &c.*

PART III.

ON THE HARMONY OF NUMBERS, AND THE METHOD OF APPLYING IT TO FORM.

In several former works I have given an outline of the harmony of numbers, and have shown that, by the proper application of this law to various branches of the arts of design connected with the practice of the architect, the painter, the sculptor, the silversmith, the potter, &c., their productions might be brought to a degree of perfection equalling what we find in the finest works of the ancients. As, however, I am now to treat of that harmony in connection with the highest object of art, it becomes requisite to give an outline of it here, in order to make what follows more easily understood.

A writer in the *British and Foreign Medical Review* remarks, with equal comprehensiveness and truth, that "there is harmony of numbers in all nature—in the force of gravity—in the planetary

movements—in the laws of heat, light, electricity, and chemical affinity—in the forms of animals and plants—in the perceptions of the mind. The direction, indeed, of modern natural and physical science is towards a generalization which shall express the fundamental laws of all by one simple numerical ratio. We think modern science will soon show that the mysticism of Pythagoras was mystical only to the unlettered, and that it was a system of philosophy founded on the then existing mathematics; which latter seems to have comprised more of the philosophy of numbers than our present."*

Harmony has been philosophically defined as "the union of contrary principles having a ratio to each other;" which contrary principles are those of uniformity and variety, and they are produced in the abstract from the various modes in which units may be combined. This numerical harmony is the root of every other species of harmony, whether addressed to the ear or the eye, and arises as follows:—

The first mode of combination is that of one unit with another, by which the number 2 is produced, which number is a submultiple of 4, 6, 8, progressively, as 2, 3, 4. It is the first even number; that is, it consists of two equal and similar portions, and these are its only aliquot parts. It, therefore, may be termed the first principle of uniformity. The second combination of the unit is 3, which is the first odd number, and is a submultiple of the numbers 6, 9, 12,

* No. XXXV, p. 171.

these being progressive multiples of 3, by 2, 3, 4. This number being also the combination of 1 and 2, may be called the first principle of inequality, or variety. The third mode of union is the combination of the two contrary principles of 2 and 3, in the number 5. This number is the third simple multiple of the unit, because it has no other aliquot parts, and combines the binary and ternary principles of union amongst units. It is a submultiple of the numbers 10, 15, 20, progressively, as 2, 3, 4. The numbers 2, 3, and 5, are, therefore, the first three multiples of the unit that have no other aliquot parts; and it will be shown, in the sequel, that by the union, in proper proportions, of the contrary principles which they exhibit, the proportion and symmetrical beauty of the human head and countenance may be abstractedly produced.

In form, generally, these principles may be applied through the medium of the circle, because by the division of its arc into parts called degrees, minutes, &c., the units are adopted by which the harmonic ratios of numerical quantity may be applied to that primary species of plane figure upon which the beauty of form especially depends, namely, the triangle. The division of the circle into 360 parts, seems to me to prove clearly the application of the laws of harmony to form by the earliest geometers; for no other number embodies, in the same harmonious relations, the numbers to which I have just alluded as the source of all harmony, namely, 2, 3, and 5.

The division of the circle by its diameter into equal parts, gives

the base line from which all angles are calculated, by the degrees contained in the arc which stands upon it, and these are in number 180, divisible into minutes, &c., as just stated. The division of the semicircle by two gives the perpendicular line to the base which divides the arc into quadrants, each of which contains 90°, and the angle thus formed with the base line is called the right angle, because it is the most perfect of its kind, all angles having more degrees being obtuse, and those having fewer being acute. This angle may, therefore, be taken as the fundamental angle, to which all others, in the first instance, should relate, as to a natural key; and it is by this means that the principle of harmonic ratio may be applied to every species of form.

A rectilineal triangle is the simplest component figure of any other rectilineal plane figure, because it has the smallest number of sides and angles. It must, therefore, be to this figure that we are to look for the most simple operation of those first principles which give symmetry to forms. The proportions of all triangles are regulated by the relative numbers of degrees which their angles contain.

The primary rectilineal plane figure is the square, which is perfectly uniform, having four angles of 90°, making in all 360°, the full number contained in the circle. When a square is bisected through two of its angles, it is reduced to its most elementary component figure, which is an isosceles triangle, having two angles of 45°

each, and one of 90°. This peculiar triangle, when bisected through its greatest angle, always produces two triangles with angles similar to itself. (Plate I., fig. 1.) The relative numbers of degrees in the angles of this triangle, therefore, exhibit the primary harmonic ratios of 1 to 1, and 1 to 2, in 45° to 45°, and 45° to 90°. Plate I.

The secondary rectilineal plane figure is the equilateral triangle, which, like the square, is perfectly uniform, having three angles of 60°, making in all 180, the number contained in the arc of the semicircle. When this triangle is bisected through one of its angles, it exhibits its primary component figure, which is a scalene triangle, having one angle of 30°, one of 60°, and one of 90°. This peculiar right-angled scalene triangle is, therefore, the elementary figure of which the equilateral triangle is composed; but it cannot, like the primary isosceles triangle, be divided into two of its own kind, the smallest number that this or any other right-angled scalene triangle can be divided into being four. (Plate I., fig. 2.) The numbers of degrees in this scalene triangle exhibit relatively to each other the harmonic ratios of 1 to 2, 1 to 3, and 2 to 3, in 30° to 60°, 30° to 90°, and 60° to 90°.

The pentagon may be termed the tertiary rectilineal plane figure, having five angles of 108° each, making in all 540°—the number contained in three semicircles, or the amount of degrees in the angles of the two preceding figures, the square and triangle. When a pentagon is bisected through one of its angles and one of its sides,

the right-angled scalene triangle formed by the bisecting line and the half of its side will be found to be its most elementary component figure, and will contain at its three angles respectively 18°, 72°, and 90°. (Plate I., fig. 3.) The numbers of degrees in the three angles of this triangle, therefore, exhibit in their relative quantities the harmonic ratios of 1 to 4, 1 to 5, and 4 to 5, in 18° to 72°, 18° to 90°, and 72° to 90°.

The degrees at the angles of those triangles, and their ratios to the right angle, may be thus represented:—

II.		III.		V.	
90°		90°		90°	
I.	I.	I.	II.	I.	IV.
45°	45°	30°	60°	18°	72°

Each of these harmonic ratios is compounded of others of a less simple kind. Thus, the simple ratio of 1 to 2, between 45° and 90°, is compounded of the two less simple ratios of 2 to 3, and 3 to 4, in 45° to 67° 30′, and 67° 30′ to 90°; and these two ratios being multiplied together, the lesser term of the one by the lesser term of the other, and the greater term of the one by the greater term of the other, produce 6 and 12, which have the same ratio to each other as 1 to 2. Again, the ratio of 2 to 3, between 60° and 90°, may be divided into the less simple ratios of 4 to 5, and 5 to 6,

in 60° to 75°, and 75° to 90°; and these ratios being multiplied as before will produce 20 and 30, which numbers have the same ratio to each other as 2 to 3. Lastly, the ratio of 4 to 5, between 72° and 90°, is divisible into the two less simple ratios of 8 to 9, and 9 to 10, in 72° to 81°, and 81° to 90°; and these ratios being multiplied as before, give 72 and 90, which numbers are to each other in the ratio of 4 to 5.

The following are, therefore, the numerical ratios found in the angles of those three triangles:—

1	to	2	in	45°	to	90°
2	—	3	—	60°	—	90°
3	—	4	—	45°	—	60°
3	—	5	—	18°	—	30°
4	—	5	—	72°	—	90°
5	—	6	—	60°	—	72°
5	—	8	—	45°	—	72°
1	—	3	—	30°	—	90°
1	—	4	—	18°	—	72°
1	—	5	—	18°	—	90°

And these ratios correspond exactly to those of the rapidity in the pulsations of the atmosphere, which, according to the well established laws of the science of acoustics, produce the most perfect consonances of sound upon the ear. This analogy, I may add, is in

no way forced; but arises naturally and necessarily from these simple elements of plane geometry.

The two first of these triangles have been called the two symmetrical triangles of Plato, who refers to them in the following words:—"Of the two triangles, the isosceles is allotted one nature, but the oblong, or scalene, is characterized by infinity. We ought, therefore, to choose the most beautiful among infinities, if we wish to commence our investigations in a becoming manner."* These three triangles are the primary elements of the five regular solids, or Platonic bodies, which are, the tetrahedron—bounded by four equilateral triangles; the octahedron—bounded by eight equilateral triangles; the icosahedron—bounded by twenty equilateral triangles; the hexahedron, or cube—bounded by six squares; and the dodecahedron—bounded by twelve pentagons. Besides these five, there can be no other solids bounded by like, equal, and regular plane figures, and the solid angles of which are all equal.

In describing these, Plato confines himself to the four first, and merely hints at the Dodecahedron in these words:—"There is also a certain fifth composition which Divinity employed in the fabrica-
Note D. tion of the universe." This body may, therefore, have been discovered by some other geometer. Be that as it may, these triangles are not only the elements of the most beautiful rectilineal plane figures, but of the most beautiful rectilineal solid bodies.

* The Works of Plato, translated by Taylor, vol. ii., p. 526.

Every regular rectilineal plane figure has a curvilineal figure which exclusively belongs to it. For instance, if we take one of the equal sides of the primary isosceles triangle, which is half of the square, as a radius of a curvilineal figure, of which the right angle of the triangle is the centre, a circle will be described whose circumference will necessarily pass through both its other angles. (Plate I., fig. 4.) The circle is, therefore, the curvilineal figure that exclusively belongs to the primary isosceles triangle.

If, in like manner, we take the two unequal sides of the primary scalene triangle, which is half of the equilateral triangle, as the semi-diameters of a curvilineal figure, of which the right angle of the triangle is the centre, an ellipse will be described, the circumference of which will necessarily pass through each of the other two angles. (Plate I., fig. 5.) This ellipse, which has many peculiar properties, fully described elsewhere,* is, therefore, the curvilineal figure that exclusively belongs to the primary scalene triangle. As the revolution of the circle upon its diameter will produce a sphere, so the revolution of the ellipse upon its transverse diameter will produce a prolate spheroid; and these two bodies are, consequently, the curvilineal solids arising from the elementary figures in which the principles of geometric harmony have been found to exist. It will therefore be seen, that the figures I have adopted as the elements of beauty, namely, the square, the equilateral triangle,

* *Essay on Ornamental Design*, p. 24.

the pentagon, the circle, and the ellipse whose proportions are derived from the elementary figure of the equilateral triangle, have not been chosen empirically, but are what have been in every age acknowledged to be the most beautiful of all forms. Before applying these elements in illustration of the science of those proportions which distinguish the ideal head of ancient Greek art, it will be requisite to say something of the general form and proportions of the human head and countenance.

PART IV.

ON THE GENERAL FORM AND BEAUTY OF THE HUMAN HEAD AND COUNTENANCE.

The most remarkable characteristics in the structure of the human head are, its globular form (or rather such union of the globular and spheroidal forms as results, both in the external figure and in its sections, in the ovoid), and the approximation of the plane of the face to a vertical line; for in none of the lower animals does the skull present so near an approach to this form, nor the plane of the face to this direction. These peculiar characteristics are variously modified among the numerous races of mankind; but one law appears to influence the whole. They are invariably found most prominently developed in the highly refined and most intellectual races of men, while the most barbarous tribes present the greatest departure from them, their heads being distinguished by compression of the anterior portion of the skull, and the consequent prominence of the mouth,

generally accompanied with flatness of the nose. The highest and most cultivated races, however, present only an approximation to the perfect development of those distinguishing marks of humanity.

Mankind is thus characterized by the partial development of a principle of beauty, in the form and position of the head and face, deducible from mathematical laws. A little further investigation will show, that the arrangement of the organs of sense upon the facial surface approximates to the development of another modification of the same principle, constituting its primary element of beauty.

In art, upon the other hand, we find that the development of this principle has, at a very early period, been carried to a higher degree of perfection than has been found in any single example in nature, and that the works of that period present to us a degree of mathematical beauty nowhere else discoverable. This species of beauty has been called the ideal, in contradistinction to that of ordinary nature, from which it differs in being free from the deformities and peculiarities constituting the individuality by which men are distinguished from each other.

Some writers upon beauty have asserted that there is no original, or positive beauty in the human countenance, and that our sense of the beautiful, as relative to it, arises from the association of ideas alone; while others affirm that this depends entirely upon expression. Sir Charles Bell, in his excellent essay upon the subject,* has shown

* *The Anatomy and Philosophy of Expression, &c.* Fourth Edition. London: John Murray, 1847.

most clearly that such doctrines are erroneous, and that there exists in the permanent form of the human head and face an innate beauty, altogether independent of the enhancement of expression, or of any association of ideas in the mind of the beholder. He observes, that those who have hitherto written on the sources of beauty have not attained to the right principle, because they have not only lost sight of nature, but of what may justly be called the philosophy of the subject. In respect to the permanent form and beauty of the human head and face, in contradistinction to expression, Sir Charles says—"Beauty of countenance may be defined in words, as well as demonstrated in art. A face may be beautiful in sleep, and a statue without expression may be highly beautiful." "But it will be said, there is expression in the sleeping figure, or in the statue. Is it not rather that we see in these the capacity for expression?—that our minds are active in imagining what may be the motions of those features when awake or animated? Thus, we speak of an expressive face before we have seen a movement, grave or cheerful, or any indication in the features of what prevails in the heart. Avoiding a mere distinction in words, let us consider, first, why a certain proportion and form of face is considered beautiful, and conveys the notion of capacity of expression; and, secondly, the movements, or the actual expression of emotion. I believe that it is the confusion between the capacity of expression and the actual indication of thought, that is the cause of the extraordinary difficulty in which the subject is involved."

This capacity for expression certainly enhances our admiration of the human countenance, but it is more a concomitant of the primary cause of its beauty than the cause itself. This cause, I believe, will be found to rest on a more simple and secure basis, namely, on geometric harmony; for the nearer the countenance approximates to a harmonious combination of the most perfect figures in geometry, or, rather, the more its general form and individual parts, with their relative proportions, are regulated by such figures, the higher will be its degree of beauty, while unaffected by expression, and the greater will be its capacity for the expression of the passions.

The Greeks were the first to impart this species of beauty to representations of the human head and countenance in the statues of their deities; but the means by which they thus excelled ordinary nature has been long buried in oblivion, and has, consequently, for many ages, formed a subject of discussion to all who have treated of the arts of design. Some of the earliest writers upon the subject, in the enthusiasm of their admiration, asserted that either the gods must have descended to the earth, or that the artists must have ascended to heaven, in order to enable the latter to impart this quality to their works. Modern writers have attempted to account for it more rationally, but the point is still far from being finally determined. Perhaps the most plausible opinion is that which attributes the attainment of this excellence by the ancient Greek artists, to their having long studied what the human countenance possessed in

common, and having thereby acquired the faculty of observing in what individuals were deficient, they thus arrived at a perfect idea of beauty. To embody this idea and refine upon nature, they composed a species of collective beauty, by selecting various parts from the most perfect models they could find in nature, which they combined together in one figure, thus producing ideal beauty. It is, therefore, the characteristic of this school, that the ideal beauty of ancient Greek art can only be arrived at by means of imitation. There have not been wanting those, however, who have affirmed, that it was not by the study of natural forms that the Greeks gave ideal beauty to their works, but by some creative and abstract principle. Note E.

M. Victor Cousin, in his *Philosophy of the Beautiful*, draws the distinction between what are termed real beauty and ideal beauty, more clearly than any other author with whose works I am acquainted. He says—"If the object that I wish to copy after nature present some beauty, the imitation is beautiful; but, after all, I only achieve *real* beauty. If I am not satisfied with one object, and I bring together a great number of models, and, in painting a human figure, take the forehead from one, the eyes from another, the smile from a third, I shall obtain beauty real and collective, but not ideal; for my work will not contain a single trait that cannot be found in one or other of the originals. In the same manner that we have distinguished absolute from collective ideas, we shall now separate ideal beauty from real beauty. But those who advocate the real exclusively, deny

the existence of the ideal, or say that it consists only in union, or in choice; which is equivalent to the negation of the ideal. The school opposed to them allows, on the contrary, only the ideal, and makes a complete abstraction of the models of nature; they are artists who work *de tête*—this is their expression. The first school, which desires to see nothing in art but an imitation of the real, forgets that all it meets in nature is but imperfect beauty—that the beautiful is concealed *beneath* the real. The second school, which takes notice of the ideal alone, falls into the opposite error, and produces works that are unapproachable by our senses. The ideal alone is cold and lifeless. We need not neglect the real in the school of art, any more than the collective idea in the school of metaphysics; but we ought not to pause at the merely collective, or at the merely real. * * * The ideal without the real is lifeless; but the real without the ideal is destitute of pure beauty. Both ought to be united. The two schools ought to give each other the hand, and be allied: the noblest works of art are the result of such a union. Thus, beauty is an absolute idea, and not a copy of finite, accidental, and imperfect nature. The idea can make itself visible in the bosom of nature, but it is always veiled and imperfect. It shines more brightly in the works of man, because the arm guided by intelligence approaches nearer to the model the mind has conceived; but still the idea can never be entirely unfolded." This I conceive to be a just definition of what is meant by ideal beauty.

Various attempts have been made to define geometrically the difference between the ordinary and the ideal beauty of the human head and countenance, the most prominent of which is that of Camper. He traced, upon a profile of the skull, a line in a horizontal direction, passing through the foramen of the ear and the exterior margin of the sockets of the front teeth of the upper jaw, upon which he raised an oblique line, tangential to the margin of these sockets, and to the most prominent part of the forehead. Agreeably to the obliquity of this line, he determined the relative proportion of the areas occupied by the brain and by the face, and hence inferred the degree of intellect. When he applied this measurement to the heads of the antique statues, he found the angle much greater than in ordinary nature; but that this simple fact afforded no rule for the reproduction of the ideal beauty of ancient Greek art, is very evident from the heads and countenances by which his treatise is illustrated. Sir Charles Bell justly remarks, that although, by Camper's method, the forehead may be thrown forward, yet, while the features of common nature are preserved, we refuse to acknowledge a similarity to the beautiful forms of the antique marbles. "It is true," he says, "that by advancing the forehead it is raised, the face is shortened, and the eye brought to the centre of the head. But with all this, there is much wanting—that which measurement, or a mere line, will not show us."—"The truth is, that we are more moved by the features than by the form of the whole head. Unless there be a

conformity in every feature to the general shape of the head, throwing the forehead forward on the face produces deformity; and the question returns with full force—How is it that we are led to concede that the antique head of the Apollo, or of the Jupiter, is beautiful when the facial line makes a hundred degrees with the horizontal line? In other words—How do we admit that to be beautiful which is not natural? Simply for the same reason that, if we discover a broken portion of an antique, a nose, or a chin of marble, we can say, without deliberation, This must have belonged to a work of antiquity; which proves that the character is distinguishable in every part—in each feature, as well as in the whole head."

Dr Oken says upon this subject:*—"The face is beautiful whose nose is parallel to the spine. No human face has grown into this estate, but every nose makes an acute angle with the spine." "The facial angle is, as is well known, 80°." "What, as yet, no man has remarked, and what is not to be remarked, either, without our view of the cranial signification, the old masters have felt through inspiration. They have not only made the facial angle a right angle, but have even stepped beyond this—the Romans going up to 96°, the Greeks even to 100°. Whence comes it that this unnatural face of the Grecian works of art is still more beautiful than that of the Roman, when the latter comes nearer unto nature? The reason

* *Phisio-philosophy.* By Dr Oken. Translated by Talk, and published by the Ray Society. London: 1848.

thereof resides in the fact of the Grecian artistic face representing nature's design more than that of the Roman; for in the former, the nose is placed quite perpendicular, or parallel to the spinal cord, and thus returns whither it has been derived."

Other various and conflicting opinions upon this subject have been given to the world; but we find that the principle from which the ideal beauty arose in the head and countenance, as represented in works of ancient Greek art, is still a matter of dispute. When, however, we examine carefully a fine specimen, we find its beauty and grandeur to depend more upon the degree of harmony amongst its parts, as to their relative proportions and mode of arrangement, than upon their excellence taken individually. It is, therefore, clear that those who attribute the beauty of ancient Greek sculpture merely to a selection of parts from various models must be in error. No assemblage of parts from ordinary nature could have produced its principal characteristic, the excess in the angle of the facial line, much less could it have led to that exquisite harmony of parts by which it is so eminently distinguished; neither can we reasonably agree with Dr Oken and others, who assert that it was produced by an exclusive degree of the inspiration of genius bestowed upon the ancient Greek artists. Note F.

That the inspiration of genius, combined with a careful study of nature, were essential elements in the production of the great works which have been handed down to us, no one will deny; but these

elements have existed in all ages, whilst the ideal head belongs exclusively to the Greeks of the periods of Pythagoras and Plato. Is it not, therefore, reasonable to suppose, that, besides genius and the study of nature, another element was employed in the production of this excellence, and that this element arose from the precise mathematical doctrines taught in the schools of these philosophers?

Müller has said—"The principles which the ancients followed in regard to proportions (ξυθμὸς, *symmetria numeris*)—and we know that this was a main object of artistic study—are naturally difficult to discover and determine, on account of the manifold modifications introduced by the application of them to different ages, sexes, and characters."*

In what follows, I shall attempt to determine those principles of
Note G. proportion, and thereby to remove the difficulty referred to by so many writers upon art, and to which Müller here alludes.

* *Ancient Art and its Remains.* By C. O. Müller. Translated from the German, by John Leitch. London: A. Fullarton & Co.

PART V.

THE SCIENCE OF PROPORTION IN RELATION TO REPRESENTATIONS OF THE HUMAN HEAD AND COUNTENANCE.

In Part III. I have endeavoured to explain the Æsthetic nature of numerical harmonic ratio, and the method by which it may be employed in applying the science of proportion to forms generally. Part IV. is designed to point out the distinguishing peculiarities of form in the human head and countenance, and wherein the ideal representations of ancient Greek art differ from ordinary nature. In the present Part it is sought to show that, by the application of these principles of numerical harmonic ratio, in accordance with a system of descriptive geometry, artistic representations of the human head and countenance may be produced, possessing all the characteristic beauties of form and proportion which distinguish those of ancient Greek art; and, at the same time, to point out

one of the deviations from this system by which ordinary nature is distinguished.

Camper's system of comparison between the beauty of the ideal head of ancient Greek art and that of ordinary nature, in its various degrees of intellectual capacity, as already explained in Part IV., was confined to the relative prominence upon the facial surface of the frontal bone of the cranium and the lower bones of the face, and was, consequently, very limited in its application. Blumenbach, finding this to be the case, and that, even within its limited range, it did not accurately apply in some cases, adopted what he termed the vertical rule. He drew his comparisons by arranging the crania, with the cheek bones in a horizontal line, so as to view them from behind the vertex, and thus he determined their degrees of approximation to the highest scale of intellect by the projection of the facial bones beyond those of the cranium; while Professor Owen recommends viewing the skull from its base, the lower jaw being removed. In the descriptive geometry adopted in this treatise, all these aspects are given, with the addition, in every case, of a front view of the skull, so that the peculiarities of each aspect are derived from the same relative proportions, and the harmonious or inharmonious arrangement of the parts. My process is as follows:—Having determined the size of the head to be represented, construct the right-angled isosceles triangle, A B C (the first of Plato, and half of the square), making

Plate I., fig. 6.

its side, A C, one-third of the determined length; and from the point C, with a radius, C A or C B, describe the circle A B D E. Construct within this circle the scalene triangle A F G (the second of Plato, and half of the equilateral triangle), and taking its sides as semi-diameters, describe the ellipse A F H I, of which A H is the major axis, and F I the minor axis.

These two triangles are symmetrically proportioned to each other in relative size, the second being formed within the curvilineal figure belonging to the first, and, consequently, being in vertical length to it in the ratio of 3 to 2. These curvilineal figures, as explained in Part III., are those that belong exclusively to the triangles from the sides of which they have received their proportions; and they are, like the triangles themselves, necessarily in the same symmetrical proportion to each other.

Let it now be supposed that these two curvilineal plane figures represent the solid bodies which a revolution upon their vertical axes would produce, namely, a sphere and a prolate spheroid, and that these bodies are united and partially amalgamated, so that the circumference of the sphere passes through the centre of the prolate spheroid, as exhibited in the next diagram. Construct the triangle A B C, describe the circle A B D E, and construct the triangle A F G, as in fig. 6. Through F draw F H, equal and parallel to G A; produce G F, making F I equal to F G; join I H, forming the triangle I H F; describe the ellipse H I K G, of which H K is the major axis,

Plate I., fig. 7.

and I G the minor axis. This diagram, therefore, represents a vertical section, through A H, or side view, of fig. 6.

Fig. 8 represents a horizontal section, or vertical aspect, of these
Plate I., fig. 8. united bodies. Construct the isosceles triangle A B C, and describe the circle A B D E, as in figure 6; make C F equal to the minor axis of the ellipse A F H I, figure 6; bisect this line in G, and with a radius, G C, describe the circle F H C I.

These two bodies, thus proportioned and united, represent the typical form of the human head and face, as it arises from this combination of the elements of geometrical beauty. From what follows, it will be seen that the organs of sense may be proportioned and arranged, agreeably to the same laws, upon the facial surface, the reader bearing in view that the surfaces of these curvilineal bodies, in whatever aspect they may be represented, are understood to be referred to a plane—the only way in which any form can be depicted on the retina of the eye.

Construct a diagram as in fig. 6, Plate I.; bisect G H in L,
Plate II., fig. 1. F G in M, and G I in N; join M L and L N; bisect M G in O, and from the centre M, with the radius M O, describe the circle O; make L V and N Z equal to M O, and from the centres L and N, with the radii L V and N Z, describe the circles V and Z. Construct the right-angled isosceles triangle L Q R, with its right angle at L, and its base tangential to the circle whose centre is L, and draw the line K P through L, parallel to F I; draw A K, making

the angle at A 18°, and complete the isosceles triangles A B E, A F I, and A K P. This diagram is composed of the elements of the five regular geometrical solids, and depends upon these elements for its proportions.

A side view of these united bodies, with a diagram of the situation and proportions of the organs of sense which thus present themselves, is the result of the following process:—Construct a diagram the same as fig. 7, Plate I.; bisect F K in M; draw the line M L at right angles with H K. From L draw the line L N at an angle of 60° with the line L M; draw the line N O parallel to H K; draw the line L P parallel to M K, and through K draw P K parallel to L M. From each of the points L and N describe a circle with a radius equal to M O, fig. 1. Construct the right-angled isosceles triangle, L Q R, with its right angle at Q; draw c d parallel to H K, and d S tangential to the circle around L. Thus, the two triangles which determine the proportions of the features are, as in fig. 1, the first and second of Plato. Plate II., fig. 2.

To show the position of the figures represented in the two preceding diagrams upon a horizontal section, or vertical aspect, of the two united bodies, construct a diagram the same as fig. 8, Plate I.; make a b, figs. 3 and 4, equal to *a b*, fig. 2; through *a*, with a radius M O, fig. 1, describe the circle of which L is the centre. Construct the right-angled isosceles triangle L M N, and describe circles around M, N, and C, whose radii are equal to L *a*. Plate II., figs. 3 and 4.

The harmonic relations of the angles of the three triangles employed in the construction of these diagrams have already been explained; and if we add to these triangles other two, A X D and A S V, fig. 1, we have the following series:—

Plate II., fig. 1.

First, a triangle whose angles are	45°	45°	90°
Second, ...	30°	60°	90°
Third, ...	22° 30′	67° 30′	90°
Fourth, ...	18°	72°	90°
Fifth, ...	15°	75°	90°

These exhibit the following harmonic ratios to the right angle:—

Smallest Angles at A.	Middle Angles at B F X K S.
45° to 90° ratio 1 to 2	45° to 90° ratio 1 to 2
30° — 90° — 1 — 3	60° — 90° — 2 — 3
22° 30′ — 90° — 1 — 4	67° 30′ — 90° — 3 — 4
18° — 90° — 1 — 5	72° — 90° — 4 — 5
15° — 90° — 1 — 6	75° — 90° — 5 — 6

The consecutive relations of these angles are as follow:—

Smallest Angles.	Middle Angles.
30° to 45° ratio 2 to 3	45° to 60° ratio 3 to 4
22° 30′ — 30° — 3 — 4	60° — 67° 30′ — 8 — 9
18° — 22° 30′ — 4 — 5	67° 30′ — 72° — 15 — 16
15° — 18° — 5 — 6	72° — 75° — 24 — 25

If we now accommodate the anatomical structure of the bones of the head to this systematic arrangement of geometrical harmony, we have the skull exhibited in its various aspects on Plate III., figs. 1, 2, 3, 4. Plate III. figs. 1, 2, 3, 4.

In the ideal heads and countenances of ancient Greek art which still exist, there is necessarily considerable variety as to general forms and relative proportions of parts, and, as already observed, this has led many who have treated of the subject to assume that it must be difficult, if not altogether impossible, to determine any definite rules for the regulation of these proportions. This difficulty I shall now attempt to remove—begging of the reader, at the same time, to keep in mind that I confine myself to such variety as belongs to the permanent form of the anatomical structure, knowing that to impart the variety which results from the action of the muscles, and gives sentiment and expression to the countenance in obedience to mental impulses, requires the highest efforts of genius, and, consequently, belongs to a branch of art beyond the scope of a treatise, the sole object of which is to point out the primary laws of geometric harmony from which the countenance derives the beauty of its proportions.

The principal varieties in the permanent form of the human head and countenance, as represented in works of ancient Greek art, are those which give, on the one hand, feminine delicacy, and, on the other, masculine power; and these are not only sometimes

blended, but exchanged, in the Greek ideal heads, as they often are in those of ordinary nature. Of this, the heads of Minerva, Venus, Juno, Apollo, Hercules, Bacchus, &c., afford ample evidence. But in thus referring to these examples, it is scarcely necessary to remark, that as the laws of harmonic proportion which I now seek to illustrate leave untouched what belongs to the wider field of creative genius, they can in no way interfere with the higher themes
Note H. of Æsthetic criticism in relation to ancient Greek art. I shall, therefore, proceed with the legitimate object of this treatise, and endeavour to show, geometrically and systematically, in what these characteristic varieties in form and proportion consist, without reference to any existing examples.

The proportions resulting from the numerical ratios in the angles of the triangles employed in constructing the diagrams in Plate II., will, I believe, on referring to Plate III., be generally acknowledged to have produced a purely feminine character of head in its anatomical structure, although, as compared with ordinary nature, of a severely geometrical cast. The change in these ratios by which a strictly masculine character of anatomical structure may be arrived at is of an equally specific kind. Instead of the series of triangles employed in constructing the diagrams in Plates I. and II., the following are adopted—the first, second, and fourth being the principal, and the third and fifth the two additional ones which necessarily result from these:—

First, a triangle whose angles are	45°	45°	90°
Second, ...	33° 45′	56° 15′	90°
Third, ...	27°	63°	90°
Fourth, ...	22° 30′	67° 30′	90°
Fifth, ...	18°	72°	90°

Exhibiting the following ratios to the right angle:—

Smallest Angles at A.	Middle Angles at B F X K S.
45° to 90° ratio 1 to 2	45° to 90° ratio 1 to 2
33° 45′ — 90° — 3 — 8	56° 15′ — 90° — 5 — 8
27° — 90° — 3 — 10	63° — 90° — 7 — 10
22° 30′ — 90° — 1 — 4	67° 30′ — 90° — 3 — 4
18° — 90° — 1 — 5	72° — 90° — 4 — 5

Plate VI., fig. 1.

The angles of these triangles have the following relations to each other consecutively:—

Smallest Angles.	Middle Angles.
33° 45′ to 45° ratio 3 to 4	45° to 56° 15′ ratio 4 to 5
27° — 33° 45′ — 4 — 5	56° 15′ — 63° — 8 — 9
22° 30′ — 27° — 5 — 6	63° — 67° 30′ — 14 — 15
18° — 22° 30′ — 4 — 5	67° 30′ — 72° — 15 — 16

The principal change, and that which governs the other triangles, it will be observed, is made upon the second triangle, which gives

its proportions to the prolate spheroid. Its smallest angle being 33° 45′, is to the smallest angle of the first triangle in the ratio of 3 to 4, instead of 2 to 3, which was the ratio between these angles in the first diagram. The change from 30° to 33° 45′ gives a ratio of 8 to 9.

Between these two specific kinds of proportion there lie numerous intermediæ, one of which, namely, that which lies midway between the two, I here give as a connecting link. Construct the right-angled isosceles triangle A B C, and describe the circle A B E, as in Plate II., fig. 1; within this construct the scalene triangle A F G, making its angle at A 31° 52′ 30″. Taking the sides of this triangle as semi-diameters, describe the ellipse A F H I; within this ellipse construct the scalene triangle A K L, making its angle at A 21° 15′; bisect G F in M, G I in N, and M G in O; and with a radius, M O, describe the circles of which M N and L are the centres. Construct the right-angled isosceles triangle, Q L R, and the diagram of the intermediate form of head is complete. Figs. 2, 3, and 4, as in Plate II., give the various aspects of these combined figures, as referred to a plane; and Plate V., figs. 1, 2, 3, and 4, the anatomical structure agreeably to these proportions.

Plate IV., fig. 1.

Plate IV., figs. 2, 3, and 4.

Plate V., figs. 1, 2, 3, and 4.

A diagram of the purely masculine proportions, the triangles of which have already been described, is formed in the following manner:—Construct the right-angled isosceles triangle A B C, proportioning the length of its sides to the full length of the intended head

Plate VI., fig. 1.

in the ratio of 4 to 11, instead of 4 to 12, as in the first diagram, and describe the circle A B L E, as in fig. 1, Plate II.; within this circle construct the scalene triangle A F G, making its angle at A 33° 45′. Taking the sides of this triangle as semi-diameters, describe the ellipse A F H I; within this ellipse construct the scalene triangle A K L, making its angle at A 22° 30′; bisect G F in M, G I in N, and M G in O; and with a radius, M O, describe the circles around M, N, and L. Construct the right-angled isosceles triangle Q L R, and the two additional scalene triangles, A X Z and A S V, making the first 27° at A, and the second 18° at A. Repeat all the scalene triangles on the opposite side, and the diagram is complete. Figs. 2, 3, and 4 receive their proportions from fig. 1, as in Plates II. and IV.

Plate VI., figs. 2, 3, and 4.

In Plate VII., the anatomical structure of the bones of the head is accommodated, in the four principal aspects, to this specific change in the geometrical harmony. On comparing this structure of skull with that given in Plate III., the characteristic difference in the general form, and in the relative proportions of parts (the whole being more square and massive), seems characterized by such a change in form and proportion as usually distinguishes the male from the female skeleton.

Plate VII., figs. 1, 2, 3, and 4.

The effects of this process of geometrical construction of the human head upon its external appearance, are exhibited in Plate VIII., figs. 1 and 2 of which are a front and a side view of the

Plate VIII., figs. 1 and 2.

head and countenance, resulting from the first species of geometrical harmony. The predominating figure of this is the scalene triangle of 30°, 60°, and 90°, and will, I believe, be acknowledged as decidedly feminine in character.

Plate VIII., figs. 3 and 4.

The head of which figs. 3 and 4 are a front and side view, is the result of the medial combination—the predominating or ruling figure of which is the scalene triangle of 31° 52′ 30″, 58° 7′ 30″, and 90°. This head is neither decidedly masculine nor decidedly feminine in its general form and proportions.

Plate VIII., figs. 5 and 6.

The decidedly masculine character of head and countenance which results from that species of geometrical harmony governed by the triangle of 33° 45′, 56° 15′, and 90°, is given in front and profile, in figs. 5 and 6.

This operation of the numerical harmonic ratios in the construction of the ideal head of ancient Greek art, proves that the science of those proportions which distinguish it is identical with the well-established science of acoustics, and while it is as mathematically precise in its fundamental principles, it equally admits of an endless variety in the production of those works which are governed by its laws. It is a fact remarked by Dr Oken in his *Physio-philosophy*, that "there are only two art senses, the eye and the ear; and thus but two departments of art, the plastic and the sonant, or that of form and motion." The result of this investigation, therefore, is the most satisfactory that could have been rationally looked for,

namely, that these senses, in their receptive powers, and the mind, in its perceptive faculty as to what these senses convey to it, are governed by one law of nature.

The establishment of this law, however, induces me to differ from Dr Oken and others, when they say that the ideal head of ancient Greek art is unnatural, because there has not been found any individual in nature with a head fully exemplifying the proportions by which it is characterized. If I have succeeded in proving that the science of these proportions is identical with the science of acoustics, the ideal head of ancient Greek art is not only the most beautiful, but also the most natural—its form and proportions being the full development of a law which is only partially developed in ordinary nature. It will be shown in the sequel that, imperfect as this development is in general, it is sufficiently decided in all cases to give to the human head that characteristic form which so distinctly marks the difference between it and those of the lower animals.

It certainly has not been recorded by any who have hitherto investigated the subject, that an individual has been found with a head and countenance in every respect possessed of equal beauty of form with those represented in ancient Greek art; yet it remains to be proved that examples of such could not have existed in nature, or may not exist. No countenance can be pronounced unnatural unless it be deformed; and although such an inclination of the

major axis of the spheroid as will throw its vertex towards that of the sphere, changes the relative proportions, and lowers the head and countenance in the scale of humanity, this does not produce deformity, unless carried beyond certain well-defined limits, presently to be pointed out. But to give, in any degree, such a direction to the major axis of the spheroid as would throw its vertex outwards from that of the sphere, will produce deformity of a species too often to be found in works of art, where the effect of superior intellect is attempted to be imparted by an exaggerated imitation of the peculiarities of the antique.

The human head, like every other object in nature, must have uniformity, combined with variety, to render it symmetrically beautiful; but these qualities must be confined within certain bounds in their relations to each other. The uniformity consists in the correspondence between the lateral halves, and the variety in the relative proportions and situations of the features. There are, consequently, even in the ideal head, various modes in which the features may be arranged, without departing from ideal beauty, but only producing a change in its character. One of these changes is exemplified in Plate IX. Figs. 1 and 2 of this Plate are a front and side view of the head, resulting from the first process, with the triangles G M L, and G N L, Plate II., fig. 1, altered from 30°, 60°, and 90° each, to 31° 52′ 30″, 58° 7′ 30″, and 90°, being the proportions of the triangle upon which the ellipse of the intermediate head

Plate IX., figs. 1 and 2.

is described. Figs. 3 and 4 are a front and side aspect of the same head, with these triangles altered to 33° 45′, 56° 15′, and 90°—the same proportions as the triangle upon which the ellipse of the masculine head is described. Figs. 5 and 6 are a front and side view of the intermediate head, with this change, that the point L, fig. 1, Plate IV., is placed upon the circumference of the circle, by which the centre triangles have angles of 37° 30′, 52° 30′, and 90°. These changes give a more sensual cast to the features, without, however, reducing their intellectual capacity, because they do not affect the form of the cranium, or its relative proportion to the bones of the face, but simply the relative proportions between the length of the upper and of the under jaw. But the variety of ordinary nature is of a different description, and most frequently manifests itself in the development of these laws in an infinity of degrees of imperfection.

Plate IX., figs. 3 and 4.

Plate IX., figs. 5 and 6.

In regard to this *original* perfection in the form and proportions of the human head and countenance—for such I conceive it to be—innumerable causes have operated, and do still continue to operate, on the one hand, in degrading it, and, on the other, in counteracting this degradation; and to these operations may be attributed that endless variety of countenance by which nations, classes, and individuals, are distinguished. Amongst such causes the effect of climate, and, still more, the degree of civilization under which a people is trained, seem to be the most effective. There can be no doubt that all the features are affected, to a great extent, by continual exposure

to excesses of heat or cold; but their character is more permanently formed by the degrees of moral restraint, as well as by the privations and toil induced by the state of society. In savage life, on the one hand, the want of mental cultivation, and the consequent dormancy of the reasoning powers, must ultimately rob the countenance of its inherent capacity for intellectual expression. The modes, also, by which the means of existence are procured, along with continual exposure to the inclemency of the seasons, must produce a permanent expression of mere animal desire, and even, in some cases, of brutal ferocity. In civilized life, on the other hand, the employment of the higher faculties of the mind, agreeable occupations and amusements, refined modes of supplying the wants of nature, and the protection afforded from the inclemency of the weather, must all conduce towards regularity of the features, and impart to the countenance a permanent composure and serenity.

As the passions by which the mind is thus moved, and the modes in which the wants of nature are supplied, act upon the muscles of the face, in giving them an enduring character, so must these muscles, in course of time, act upon the bones to which they are attached, producing a permanent effect upon the structure of the skull, which ultimately becomes hereditary in nations and classes. Hence the protruding jaws and high cheek-bones of savage tribes, as compared with those of the more civilized races of mankind.

I shall now endeavour to illustrate the process by which the

anatomical structure of the head geometrically changes from the most perfect development of the science of proportion, as exemplified in works of ancient Greek art, down to the most imperfect of ordinary nature.

It has been observed in Part IV., that the structural characteristic of the human head was such a mixture of the globular, or spherical, and spheroidal forms, as resulted in an ovoidal figure, either in a front or vertical aspect, and that the natural position of the profile tended towards a vertical direction; also, that the nearer to the perfectly vertical, the more intellectual and beautiful is the cast of the countenance, and consequently, the more it inclines towards the horizontal, it becomes the less marked by these characteristics of humanity. In the combination of the sphere with the prolate spheroid, which forms the basis of the geometrical process by which the ideal heads explained in this part, and shown in Plates VIII. and IX., are produced, the axis of the spheroid is made parallel to a vertical line passing through the centre of the sphere; to which parallelism, agreeably to the principles adopted in this treatise, the principal distinction between the artistic head of ancient Greek art and that of ordinary nature is to be attributed. According to the same principles, I shall now proceed to show how a departure from this parallelism affects the general structure of the head, and relative position of the features upon the facial surface, and that it does so without any change being made on the proportions farther than what the degree

of this inclination produces. The farthest limit to which I shall carry this inclination of the axis is 27°, which gives the general form and characteristic proportions of the head of the African negro, or those of a European of the lowest grade. According to many writers on the natural history of man, there have existed abnormal races of a lower class than this change in the geometrical structure indicates; but the discussion of such questions does not influence my subject, as the existence or non-existence of such races leaves the principles I am attempting to demonstrate unaffected.

Between the vertical position of the axis and an inclination of 27°, there are an ample number of gradations to embrace every species of characteristic form; but in order to give a sufficiently marked distinction, I shall take, as a connecting link, an inclination of 18°. The parallelism of the axis of the spheroid to the vertical axis of the sphere, in the examples already given, enabled me to commence with the diagram of a front view of the head and countenance; but, as in such an aspect the inclination about to be given could not be perceived, unless in its effects, I shall now commence with the diagram of a profile, which, accordingly, is fig. 1, in the following examples, instead of fig. 2, as in those already given. The change from the ideal, exhibited in this connecting link, may be described as follows:—

Plate X., fig. 1. Construct a diagram of the circle and first ellipse, with their principal divisions, as in fig. 2, Plate II., but, instead of making the major axis of the ellipse H K parallel to the vertical diameter A D

of the circle A E D B, give its vertex, H, an inclination of 18°, keeping its centre, F, on the circumference of the circle A E D B, and its own circumference tangential to a line, Y Z, drawn through A, at right angles with A D. Upon this diagram draw the line a b through F, parallel to A D. At right angles with a b, draw the lines E t, through C; c d, through N; e S, through L; and g h, through f. The other three diagrams, figs. 2, 3, and 4, of this example, take their proportions from the vertical and horizontal lines of fig. 1. Plate X., figs. 2, 3, and 4.

Plate XI. exhibits the change upon the anatomical structure of the bones of the head and face, produced by this inclination of the axis of the first ellipse, and, consequently, of the axis of the prolate spheroid which it represents. Plate XI., figs. 1, 2, 3, and 4.

Plate XII. exhibits the change upon the anatomical structure, agreeably to the second, or intermediate, proportions. Plate XII., figs. 1, 2, 3, and 4.

Plate XIII. exhibits the change upon the anatomical structure, agreeably to the third, or most masculine, proportions. Plate XIII., figs. 1, 2, 3, and 4.

Figs. 1, 2, 3, 4, 5, and 6, of Plate XIV., exemplify the external appearance of the heads and countenances formed upon the anatomical structure, agreeably to the three kinds of proportions, as modified by the inclination of 18° of the prolate spheroid. Plate XIV., figs. 1, 2, 3, 4, 5, and 6.

The diagram in Plate XV., except in one point, being the same as that given in Plate X., farther description is unnecessary, than merely to state that the inclination of the axis of the spheroid is here carried to 27°, which I conceive to be its natural limit. This Plate XV., fig. 1.

farther inclination, it will be observed, materially affects the other figures, and gives to the three anatomical structures which follow, in Plates XVI., XVII, and XVIII., the peculiar characteristics of form which belong to the skull of the negro. These, like the three foregoing skulls, are drawn upon diagrams of the first, second, and third class, or of the feminine, medial, and masculine proportions; and the following example gives the heads and countenances formed upon them, with the characteristic thick lips and woolly hair of the African negro.

Figs. 2, 3, 4. Plates XVI., XVII., and XVIII.

Plate XIX.

Although thick lips and woolly hair (unless in rare and apparently accidental exceptions) compose part of the clothing of this structure of skull in the African negro, they do not seem to assist in lowering the intellectual character of the countenance resulting from it. These peculiarities in the clothing of the structure appear rather to modify the effects of its departure from the mathematical beauty with which the Creator originally endowed it. This I have endeavoured to make apparent, by clothing the same skulls with such European features as are suitable to their structure. A species of countenance is thus produced not unfrequently to be met with amongst ourselves, and evidently the result of a degraded state of society.

Plate XX., figs. 1, 2, 3, 4, 5, and 6.

When we compare the heads on Plate XIV. with the antique or ideal heads on Plate VIII., there seems a very considerable hiatus. In order, therefore, to give a connecting link, I have exemplified the effects of an inclination of 9°, the exact intermediate between

Plate XXI.

a vertical position and an inclination of 18°. The head and features resulting from this diagram, and given in Plate XXII., although exhibiting such an approximation to a full development of the science of proportion as we seldom meet with in ordinary nature, is still evidently devoid of the peculiar grandeur produced by the perfect parallelism of the axis of the prolate spheroid to the vertical axis of the sphere. Plate XXII. figs. 3 and 4.

To the Plates given in illustration of the nature of the science of proportion, and the mode of its application, I have added other three, in order to show the effect of some of those geometric heads when freed from the lines of the diagrams, and decorated in the Greek style.

Figs. 1 and 2, of Plate XXIII., are a front view and profile of a female head, drawn agreeably to the geometric diagram and anatomical structure in Plates II. and III. Figs. 3 and 4, are a front and side aspect of a male head, drawn agreeably to the diagram and anatomical structure in Plates VI. and VII. These heads are given, with the lines upon them, in Plate VIII., figs. 1 and 2, 5 and 6. Plate XXIII.

Figs. 1, 2, 3, and 4, of Plate XXIV., are front views and profiles of two female heads, drawn agreeably to the geometric diagram and anatomical structure in Plates II. and III., and modified, as shown in Plate IX., figs 1, 2, 3, and 4. Plate XXIV.

Figs. 1 and 2, of Plate XXV., are a front view and profile of a female head, drawn agreeably to the geometric diagram and ana- Plate XXV.

tomical structure in Plates IV. and V. This head is given, with the geometrical lines upon it, in Plate VIII., figs. 3 and 4. Figs. 3 and 4, are a front view and profile of the same head, with the geometrical construction modified, as shown by the male head, figs. 5 and 6, Plate IX.

Thus have I endeavoured to trace to its primary elements the beauty of proportion which distinguishes the artistic head of ancient Greek art from that of ordinary nature. I have shown that these elements are of the most simple kind, and that the peculiarity of their nature consists in an embodiment of the fundamental principles of numerical ratio; which, thus applied, are as much the cause of that harmony of form by which all the parts unite in one pleasing whole, as they are, by a well understood law of nature, the source of harmony amongst various sounds when simultaneously addressed to the ear. These ratios are, therefore, the first principles of formative beauty, and constitute a science of proportion sufficiently definite to admit of universal application in the arts of design.

NOTES.

NOTES.

NOTE A, (P. 6.)

The distinction between the truly beautiful and the merely agreeable is clearly defined by Cousin. He observes—"When we cast our eyes over existing nature, whether it be over the life that is called human, or that more extensive organic life, or even over inanimate nature, subject only to mechanical laws, we meet with objects that make us feel pleasing or painful sensations. A form is present to your eyes, and at the moment that you know it *is*, you feel an agreeable or a disagreeable sensation. If you are asked why it pleases you, you cannot give a reason; if you are told that it displeases others, you are not surprised, because you know that sensibility is not constant, and that it is not necessary to dispute about sensations. Up to this point we have not slipped into the domain of art; its object is beauty, and we are but at the agreeable. Now, does it not sometimes happen that a form is not only agreeable to us, but, beyond this, that it appears *beautiful* to us? When we were asked why it was agreeable to us, we could only have answered, according to our individual right, 'I am the sole judge of what pleases or displeases me;' but when we are asked why we call this form beautiful, we appeal to an authority which is not our own, which is imposed on all men—the authority of reason. . . . . .

"To the question, What are the characteristics of the agreeable and of the beautiful? we reply, that it will be shown presently that unity, proportion, simplicity, regularity,

grandeur, and generality, appear more or less in objects that we call beautiful; and that variety, motion, pliantness, energy, and individuality, are marks of the agreeable."*

The want of a more extensive dissemination of such correct and comprehensive views upon this subject, has led to the erroneous notion that every one has a right to hold his own opinions as to the beauty of proportion in works of formative art. The author, therefore, feels that he cannot recommend too strongly to his readers the study of Cousin's excellent work, from which the above extract is taken.

NOTE B, (P. 10.)

THE full title of the work here referred to is—*An Inquiry into the Original of our Ideas of Beauty and Virtue: in two Treatises, in which the Principles of the late Earl of Shaftsbury are Explained and Defended against the Author of the Fable of the Bees; and the Ideas of Moral Good and Evil are established, according to the Sentiments of the Ancient Moralists. With an Attempt to introduce a Mathematical Calculation in subjects of Morality.* London: 1725.

The author of this work makes many excellent observations upon the nature of beauty with reference to art, from which I shall select the following. He observes (p. 6) —"The only pleasure of sense that our philosophers seem to consider, is that which accompanies the simple ideas of sensation; but there are vastly greater pleasures in those complex ideas of objects, which obtain the names of beautiful, regular, harmonious." . . . . . .

At p. 7 he says, "It is of no consequence whether we call these ideas of beauty and harmony, perceptions of the external senses of seeing and hearing, or not. I should rather choose to call our power of perceiving these ideas an *internal sense*, were it only for the convenience of distinguishing them from other sensations of seeing and hearing which men may have without pereception of beauty and harmony."

* *The Philosophy of the Beautiful.* From the French of Victor Cousin. Translated, with Notes and an Introduction, by Jesse Cato Daniel, Cheshunt College. London: William Pickering. 1848.

This is exactly the difference between what we are enabled to pronounce as beautiful, or, simply, as pleasing to our senses.

At p. 33 are the following observations:—"As to the works of art, were we to run through the various artificial contrivances or structures, we should find the foundation of the *beauty* which appears in them to be constantly some kind of *uniformity*, or *unity* of proportion among the parts, and of each part to the whole. As there is a vast diversity of proportions possible, and different kinds of *uniformity*, so there is room enough for that diversity of fancies observable in *architecture*, *gardening*, and such like arts, in different *nations:* they all may have *uniformity*, though the parts in one may differ from those in another. The *Chinese* or *Persian* buildings are not like the *Grecian* and *Roman*, and yet the former has its *uniformity* of the various parts to each other, and to the whole, as well as the latter. In that kind of architecture which the EUROPEANS call *regular*, the *uniformity* of parts is very obvious, the several parts are *regular figures*, and either *equal* or *similar* at least in the same range; the pedestals are *parallelopipedons*, or square *prisms;* the pillars, cylinders nearly; the arches circular, and all those of the same row *equal;* there is the same proportion everywhere observed in the same range between the diameters of pillars, and their *heights*—their capitals, and the *diameters* of *arches*—the *heights* of the pedestals, the *projections* of the *cornice*, and all ornaments in each of our *five orders*. And though other countries do not follow the *Grecian* or *Roman* proportions, yet there is even among them a proportion retained, a *uniformity*, and resemblance of corresponding figures; and every deviation in one part from that proportion which is observed in the rest of the building, is displeasing to every eye, and destroys or diminishes at least the *beauty* of the whole.

"The same might be observed through all other works of *art*, even to the meanest *utensil*, the *beauty* of every one of which we shall always find to have the same foundation of *uniformity amidst variety*, without which they shall appear mean, irregular, and deformed."

The soundness of these doctrines is not surpassed, and has been seldom equalled, by writers upon art of the present day.

NOTE C, (P. 20.)

I THINK it requisite to lay the following facts before the reader, connected as they are with the mode of æsthetic culture adopted in this country.

So far back as March 1836, a select committee of the House of Commons was appointed "to inquire into the best means of extending a knowledge of the ARTS and of the PRINCIPLES OF DESIGN among the people (especially the manufacturing population) of the country; also, to inquire into the constitution, management, and effects of institutions connected with the arts."

Amongst many others, I had the honour to be examined before this committee, and on that occasion stated my firm conviction that the best mode of extending a knowledge of art and of the principles of design among the people (especially the manufacturing population) of the country, would be to disseminate such printed instructions as would enable the rising generation to commence a system of self-tuition, by first practising the drawing of geometrical figures by the free hand, and then to study from the large well-developed leaves of such plants as were to be found on the road-sides and hedge-rows throughout the country; observing, that as great elegance of form is to be found in the common dock, the thistle, the fern, and even in a stalk of oats or barley, those who thus formed their taste, when they came to study the ornamental remains of Athens and Rome, would find themselves familiar with the source from which the beauty of those works was in a great measure derived; for the ancients adopted the most common productions of nature for the leading features of their ornamental designs. I also observed, that this kind of study could not be commenced too early, or made too general, as, independently of its usefulness, it would prove a continual source of pleasure to all who might adopt it—and being a means of drawing out the latent talent of the country, would thereby form a test by which teachers could select their pupils; concluding, that schools established upon such a basis would conduce more to originality of ornamental design amongst our manufacturing population than any other means that could be employed.

When asked by the chairman, if I did not consider that free access to a collection of casts from the antique would be of service, I replied, "Undoubtedly it would; but such examples would be of tenfold benefit to those who had brought themselves to a degree of proficiency by the mode I have already recommended. It is at this stage that the works of the ancients ought to be studied, in order to derive benefit from their beautiful combinations, but not servilely copied: I consider servile copying of the works of others very injurious to the ornamental designer, as it retards originality of conception." —(*Report*, 568—*Arts and Manufactures*—16*th August* 1836. Pp. 37 to 43.)

Such was the general tenor of the suggestions I made on that occasion; but they do not seem to have had any weight with the committee, as the result of its labours was the establishment, early in the following year (1837), of a Government School of Design at Somerset House, in which the means employed for "extending a knowledge of the ARTS and of the PRINCIPLES OF DESIGN amongst the manufacturing population of the country" have been lately brought to light, in the following manner:—

In 1847, ten years after the establishment of this school, a committee of the Board of Trade was appointed to investigate the mode in which it forwarded the objects for which it was instituted. One of the leading witnesses examined before this committee says—"At present, copying is the plan laid down, and thus the pupil is led to no higher exertion of his faculties than the desire to imitate." Another witness says—"Instead of any attempt being made to teach the principles of any style of ornament, the only principle acted upon is that of continual copying. And this system is not merely suffered, but encouraged; indeed, I may say that it is the only system taught."

The result of this investigation has necessarily been an alteration in the constitution of the school, by which it is hoped better means may be used for extending a knowledge of art amongst the people.

One of the resolutions, in the Report of the second special committee, augurs well, being a step towards a system of self-tuition, namely—"That the Committee of Instruction should take into immediate consideration the question of establishing elementary schools, and the practicability of relieving the head school of a large number of young students who have not attained a certain degree of knowledge of the principles and practice of drawing."

The facts to which I have alluded, however, fully warrant the statements I have made in the text regarding our mode of æsthetic culture.

NOTE D, (P. 28.)

In order that the reader may judge for himself as to the accuracy of what I have stated in the text regarding the Platonic theory, as translations of the works of that philosopher are not very widely circulated, I shall here (as in a former work) give the whole passage referring to these triangles:—

"But when the Artificer began to adorn the universe, he first of all figured with forms and numbers fire and earth, water and air, which possessed, indeed, certain traces of the true elements, but were in every respect so constituted as it becomes anything to be from which Deity is absent. But we should always persevere in asserting that Divinity rendered them as much as possible the most beautiful and the best, when they were in a state of existence opposite to such a condition. I shall now, therefore, endeavour to unfold to you the distribution and generation of these by a discourse, unusual indeed, but to you who have trod in all the paths of erudition through which demonstration is necessarily obtained, perspicuous and plain. In the first place, then, that fire and earth, water and air, are bodies, is perspicuous to every one. But every species of body possesses profundity; and it is necessary that every depth should comprehend the nature of a plane. Again, the rectitude of the base of a plane is composed from triangles. But all triangles originate from two species, one of which possesses one right angle, and the other two acute angles, and one of these contains one right angle distributed with equal sides; but, in the other, unequal angles are distributed with unequal sides. Hence, proceeding according to assimilative reasons, conjoined with necessity, we shall establish a principle of this kind as the origin of fire and all other bodies. The supernal principles of these, indeed, are known to Divinity, and to the man who is in friendship with Divinity.

"But it is necessary to relate by what means four most beautiful bodies were produced, dissimilar, indeed, to each other, but which are able, from certain dissolutions

into each other, to become the sources of each other's generation; for if we are able to accomplish this, we shall obtain the truth concerning the generation of earth and fire, and of those elements which are situated according to analogy between these; and then we shall not assent to any one who should assert that there are visible bodies more beautiful than these, each of which subsists according to one kind. We must endeavour, therefore, to harmonize the four sorts of bodies excelling in beauty, and to evince by this means that we sufficiently comprehend the nature of these. Of the two triangles, indeed, the isosceles is allotted one nature, but the oblong or scalene is characterized by infinity. We ought, therefore, to choose the most beautiful among infinities, if we wish to commence our investigation in a becoming manner. And if any one shall assert that he has chosen something more beautiful for the composition of these, we shall suffer his opinion to prevail, considering him not as an enemy, but as a friend. Of many triangles, therefore, we shall establish one as most beautiful (neglecting the rest)—I mean the equilateral, which is composed from three parts of a scalene triangle. To assign the reason of this would, indeed, require a prolix dissertation; but a pleasant reward will remain for him who, by a diligent investigation, finds this to be the case. We have, therefore, selected two triangles out of many, from which the body of fire and of the other elements is fabricated, one of which is isosceles, but the other is that which always has its longer side triply greater in power than the shorter.

"But that which we formerly asserted without sufficient security, it is now necessary more accurately to define; for it appeared to us, though improperly, that all these four natures were mutually generated from each other; but they are in reality generated from the triangles which we have just described—three of them, indeed, from one triangle containing unequal sides; but the fourth alone is aptly composed from the isosceles triangle. All of them, therefore, are not able, by a dissolution into each other, to produce from many small things a mighty few, or the contrary. This, indeed, can be effected by three of them; for, as all the three are naturally generated from one triangle, when the greater parts are dissolved, many small parts are composed from them, receiving figures accommodated to their natures. And, again, when the many small parts, being scattered according to triangles, produce a number of one bulk, they complete one mighty species of a different kind. And thus much may suffice concerning their mutual generation.

"It now remains that we should speak concerning the quality of each of their kinds, and relate from what concurring numbers they were collected together. The first species, indeed, is that which was composed from the fewest triangles, and is the element of that which has its longer side twice the length of the shorter side, which it subtends. But two of these being mutually placed according to the diameter, and this happening thrice, the diameters and the shorter sides passing into the same as into a centre, hence one equilateral triangle is produced from six triangles; but four equilateral triangles, being composed according to three plane angles, form one solid angle, and this the most obtuse of all the plane angles from which it is composed. Hence, from four triangles of this kind receiving their completion, the first solid species was constituted, distributive of the whole circumference into equal and similar parts. But the second was formed from the same triangles, but at the same time constituted according to eight equilateral triangles, which produced one solid angle from four planes, so that the second body received its completion from the composition of six triangles of this kind. And the third arose from the conjunction of twice sixty elements, and twelve solid angles, each of which having twenty equilateral bases, is contained by five plane equilateral triangles. In this manner, then, the other elements generated these. But the isosceles triangle, being constituted according to four triangles, and collecting the right angles at the centre, and forming one equilateral quadrangle, generated the nature of the fourth element. But six such as these being conjoined, produced eight solid angles, each of which is harmonized together, according to three plane right angles. Hence the figure of the body thus composed is cubical, obtaining six plane quadrangular equilateral bases. There is also a certain fifth composition, which Divinity employed in the fabrication of the universe, and when he delineated those forms, the contemplation of which may justly lead some one to doubt whether it is proper to assert that the number of worlds is infinite or finite."—*The Works of Plato*, translated by Taylor, Vol. II., p. 526.

NOTE E, (P. 35.)

In the year 1807, the *Académie des Inscriptions et Belles Léttres* offered a prize on the following question: "What were the chief causes which produced the great schools of sculpture and painting among the Greeks; and by what means can they be reproduced?" On the competition for this prize, M. Victor Cousin makes the following remarks:—

"The successful writer, M. Emérie David, maintained that it was by the contemplation and constant study of real forms, by the exact reproduction of natural objects, that the ancients had raised the arts to the highest degree of perfection; and that, therefore, imitation alone could help us to reach the Grecian beauty, the true expression of life. M. Quatremère de Quincy contested this opinion, and affirmed that it was not by the study of natural forms, but by realizing ideal beauty, that the Greeks brought those works to light which are not found in nature. He showed that there are two great principles in the arts, the one individual and imitative—the other general, abstract, absolute, and creative. The first can produce nothing but portraits—the second arrives at the purely beautiful. M. Emérie David maintained that ideal beauty is the model, and the model is in nature. M. Quatremère proved that the model, however beautiful it may be, is always nothing but one of the less imperfect of the human species. Art, according to M. de Quincy, expresses the general and the absolute; according to M. Emérie David, it expresses the individual. These two theories can be reconciled, if, in the arts, we are not ruled entirely by the individual, or entirely by the absolute. Shall we resign ourselves to the exclusive contemplation of the individual, or shall we view the model as a perfect ideal, of which there is not a vestige in living nature? The question again returns to that of the mathematical circle. My opinion is, that we begin at once, at the same moment, with the individual and the absolute. At the sight of a natural figure which possesses some rude proportion, the mind gifted with power to conceive of the absolute and general, when this figure is presented to it, constructs it into a perfect circle. But man can never realize in *matter* a geometrical circle: he can only produce a natural one, and therefore an imperfect one. It is thus that, in the idea of the true, the beautiful, and the good, there are always two elements blended—the one concrete and particular,

the other abstract and absolute. As we have already said, there are two kinds of abstraction: *First*, We examine several individuals; we overlook their differences, that we may attend to their resemblances; thence we form a kind of collective unity: this operation of the mind may be called comparative abstraction; *Secondly*, By an abstraction of another kind, one object being given, without having recourse to any comparison, we disengage from that one object a general and absolute view-point. I call this operation of the mind, immediate abstraction. This is true not only of pure geometry, but of the conception of the beautiful in the fine arts, and of the good in morals. . . . . Ideal beauty, then, is evolved from real beauty, by an immediate abstraction which perceives the one in the other. The operation is twofold; if it were not, we should obtain the individual by itself, or the absolute by itself—that is to say, life without the ideal, or the ideal without life. Art must devote itself to the production of the ideal and of nature equally."—*Philosophy of the Beautiful*, p. 32.

NOTE F, (P. 39.)

In the article on the Fine Arts, in the seventh edition of the *Encyclopædia Britannica*, the author (Hazlitt) attributes the ideal beauty of the Greek statues to the immediate imitation of nature, and remarks—"What has given rise to the common notion of the *ideal* as something quite distinct from *actual nature*, is probably the perfection of the Greek statues. Not seeing among ourselves anything to correspond in beauty and grandeur, either with the features or form of the limbs in these exquisite remains of antiquity, it was an obvious, but a superficial conclusion, that they must have been created from the idea existing in the artist's mind, and could not have been copied from anything existing in nature;" and continues to argue that "the general form both of the face and figure which we observe in the old statues is not an ideal abstraction—is not a fanciful invention of the sculptor, but is as completely local and national (though it happens to be more beautiful) as the figures on a Chinese screen, or the copperplate engraving of a negro chieftain in a book of travels." He farther remarks, that "the Greek form appears to

have been naturally beautiful, and had, besides, every advantage of climate, of dress, of exercise, and modes of life to improve it;" and supposes from these causes, operating in conjunction with that of the artist having every opportunity afforded him for studying the human form, ideal beauty was produced.

In the article on Painting, in the same publication, the author (Haydon) attributes the perfection of Greek art to a very different cause, and observes—"The whole history of ancient art shows the estimation in which the unsophisticated judgment of the public was held. Aristotle says—'The multitude is the surest judge of the productions of art.' 'If you do not get the applause of the public,' says some one else, 'what celebrity can you attain?' and Cicero makes the public the supreme judge. Thus, then, no one ought to wonder at the perfection of Greek genius in everything, stimulated as it was by these secondary causes, and the one acting upon the other in a climate adapted in every way for comfort, health, and for convenience. The Greeks were men like ourselves; not larger, as their arms prove, and not handsomer, for there exist as fine forms, in either sex, in Great Britain, as ever graced the *atélier* of Zeuxis; indeed, Cicero complains of the plainness of the Athenians. When genius and secondary causes unite, as they sometimes do, then such men as Pericles and Alexander, and Polygnotus, Zeuxis, and Apelles, are the result."

These very opposite opinions, advanced in the same publication by two such popular writers on the fine arts, prove how very unsettled the question still remains.

As to the particular proportions of the human countenance, generally given in those lectures upon the principles and practice of the arts, upon which the public has so much reliance, Haydon's directions are a fair specimen. He says—"The head is four noses from top to chin, and from ending of hair in front, three to chin; make the forehead broad, not 'villanous low,' as Shakspeare says; the eyes, an eye separate; the face, from the root of the hair to the chin, three noses; the upper lip, a fourth of the nose; the ear, two noses sideways from the nostrils," &c.—*Lectures on Painting*, p. 71.

NOTE G, (P. 40.)

In farther illustration of this part of my subject, I shall here give some quotations from Mengs, Winckelmann, Leonardo da Vinci, and Bossi, which I have selected (along with some accompanying observations of the author) from one of the best works upon the beauty of the human form with which I am acquainted.*

Mengs, in treating of the remains of ancient Etruscan and Greek statues, says—"In these figures we find a proportion, impossible to be known and practised without an art which furnishes sure *rules*. These rules could not be founded otherwise than in proportion, which was invented and practised by the Greeks."

"That the Greeks," says Bossi, "wrote much on this subject (their doctrine respecting symmetry) we have ample evidence in Pliny, Vitruvius himself, Philostratus the younger, and others.

"Polycletus did not confine himself to giving a commentary upon this fundamental point, but, in illustration of his treatise, according to Galen, made an admirable statue, that confirmed the precepts laid down in the work; and *The Rule of Polycletus*, the name given to this statue, became so famous for its beauty, that it passed into a proverb to express a perfect body, as we may find in Lucian. But of so many treatises not a fragment remains (except the few lines of Vitruvius), nor is there now any hope that a vestige will be found, unless something may remain for posterity amongst the papyri of Herculaneum."

Upon this Mr Walker justly remarks—"Now, to approach to the ancients in excellence is quite impossible, until some one shall explain the great principles upon which they acted. Assuredly they are, in some of the most important respects, unknown at present. Servile imitation will never answer the purpose; and to learn as the ancients did, and reach perfection, perhaps in as many ages, is not very rational, when we can avail ourselves of their practice to discover their principles." "It is probable," says Winckelmann, "that the Grecian artists, in imitation of the Egyptians, had fixed, by well-determined rules, not only the largest, but even the very smallest proportions, and

* *Beauty, illustrated chiefly by an Analysis and Classification of Beauty in Woman.* By Alexander Walker. London: Henry G. Bohn. 1846.

the measure of the length proper to every age and to every kind of contour; and probably all these rules were learnt by young persons from books that treated of symmetry."

Mr Walker then proceeds to show that these rules were of three kinds, namely, numerical, geometrical, and harmonic—that the first is evidently that of which Vitruvius has preserved some notions—that the second has been treated of by Leonardo da Vinci, and more lately by Camper. But as to the harmonic method, he observes that it has always been the chief difficulty, and evidently formed a stumblingblock even to Leonardo da Vinci, in regard to whom he quotes the following from Bossi: "He (Leonardo da Vinci) thought but little of any general measure of the species; and that *the true proportion* admitted by him, and acknowledged to be of difficult investigation, is solely *the proportion of an individual in regard to himself*, which, according to the true imitation, should be *different in all the individuals of a species*, as is the case in nature. 'Thus,' says he (Leonardo da Vinci), '*all the parts of any animal should correspond with the whole;* that which is short and thick, should have every member short and thick; that which is long and thin, every member long and thin; and that which is between the two, members of a proportionate size. From this and other precepts, it follows, that, when he speaks of propertion, he is to be understood as referring to the *harmony of parts of an individual*, and not to the general rule of imitation in reference to dimensions. It would seem he felt within himself that he did not reach the perfection of those wonderful ancients of whom he professed himself the admirer and disciple.

"It became, therefore, Leonardo's particular care and study to approach as nearly as he could to the ancients in the true imitation of beautiful nature under the guidance of philosophy. But, whether from want of great examples, or from not sufficiently penetrating, as he himself thought, into these artifices, or from comprehending them too late, he modestly laments that he did not possess the ancient art of proportions. . . . . But how difficult it is to combine the beautiful and elegant with easy and harmonic measures, may be judged from the vain attempts of many otherwise ingenious men. . . . . The difficulty will be still more evident, if we reflect how arduous a task it is to make the proportions that the Greeks denominated numerical, harmonic, and geometrical, agree together, and to apply them, thus agreeing, to the formation of rules and measures of a visible object so various in its component parts as the human body."

NOTE H, (P. 48.)

THE reader who wishes to become acquainted with the merits of those remains of ancient Greek art, to which I have referred in the text, freed from all dry technicalities, and resulting from careful observation and study of the originals, is referred to a recent work, entitled, *Ancient and Modern Art, Historical and Critical*, by George Cleghorn, Esq., published by Messrs W. Blackwood and Sons, in which he will find that elegant and correct style of Æsthetic criticism which can only emanate from a highly cultivated mind and sound judgment.

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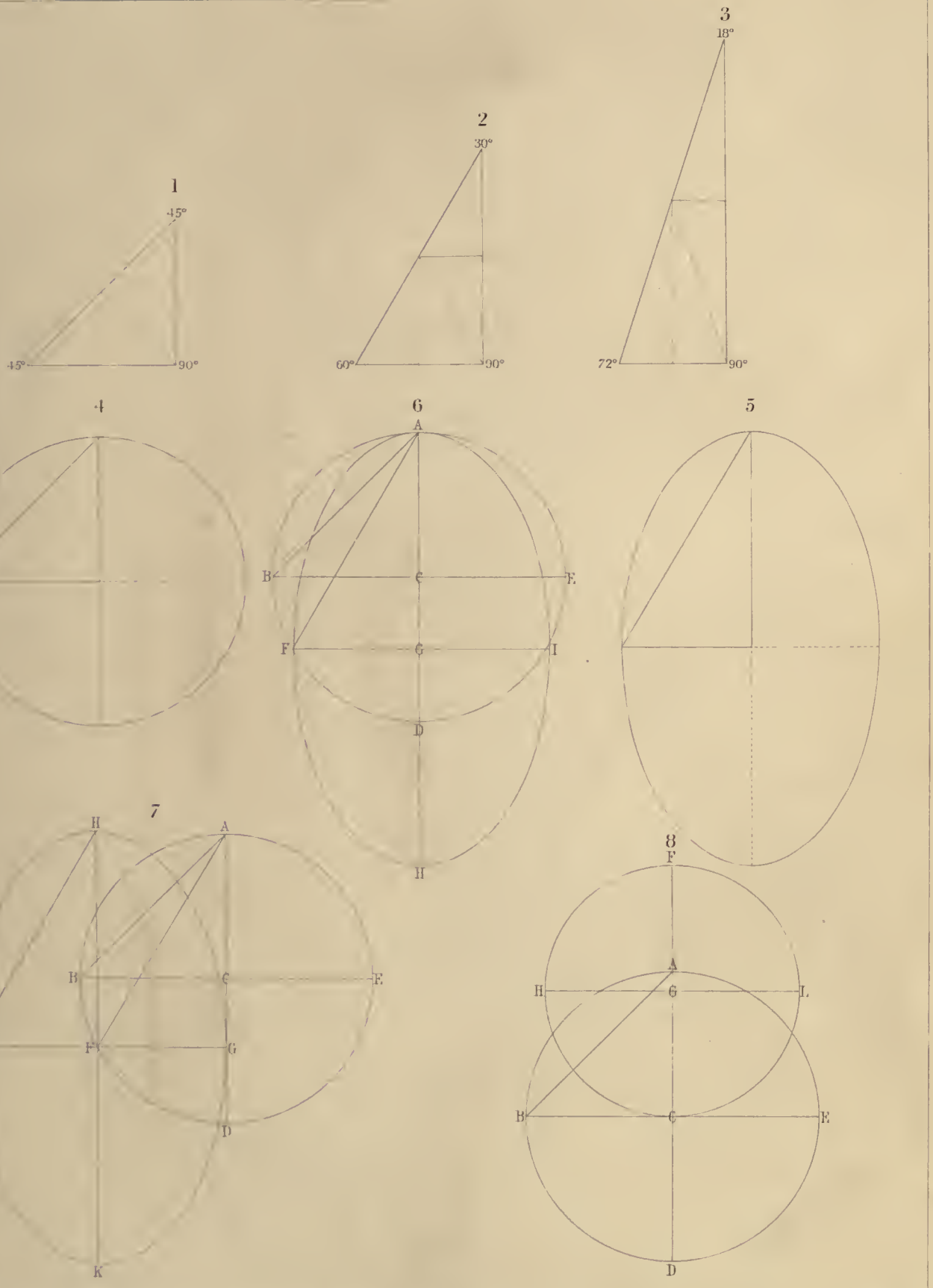
PLATES.



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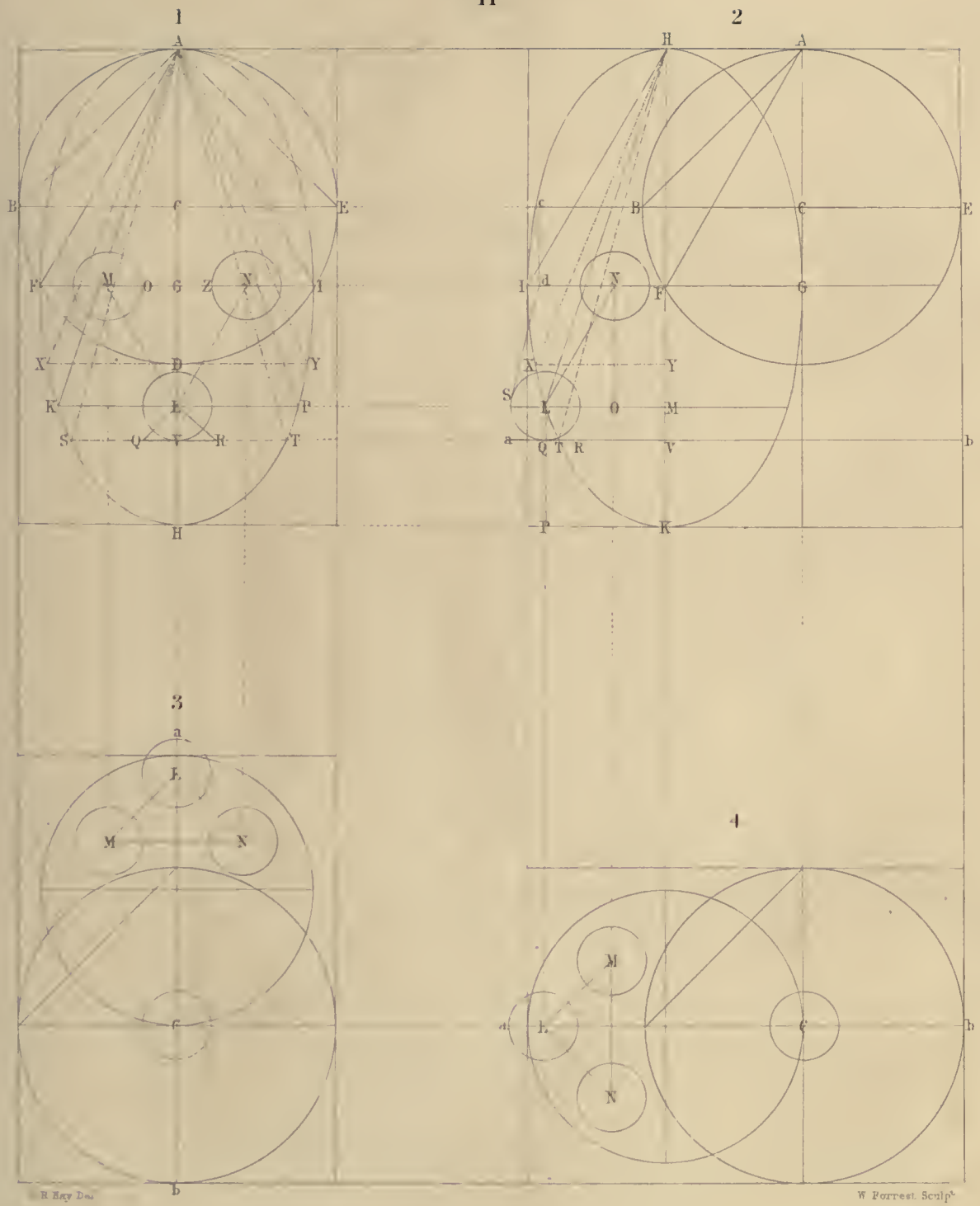
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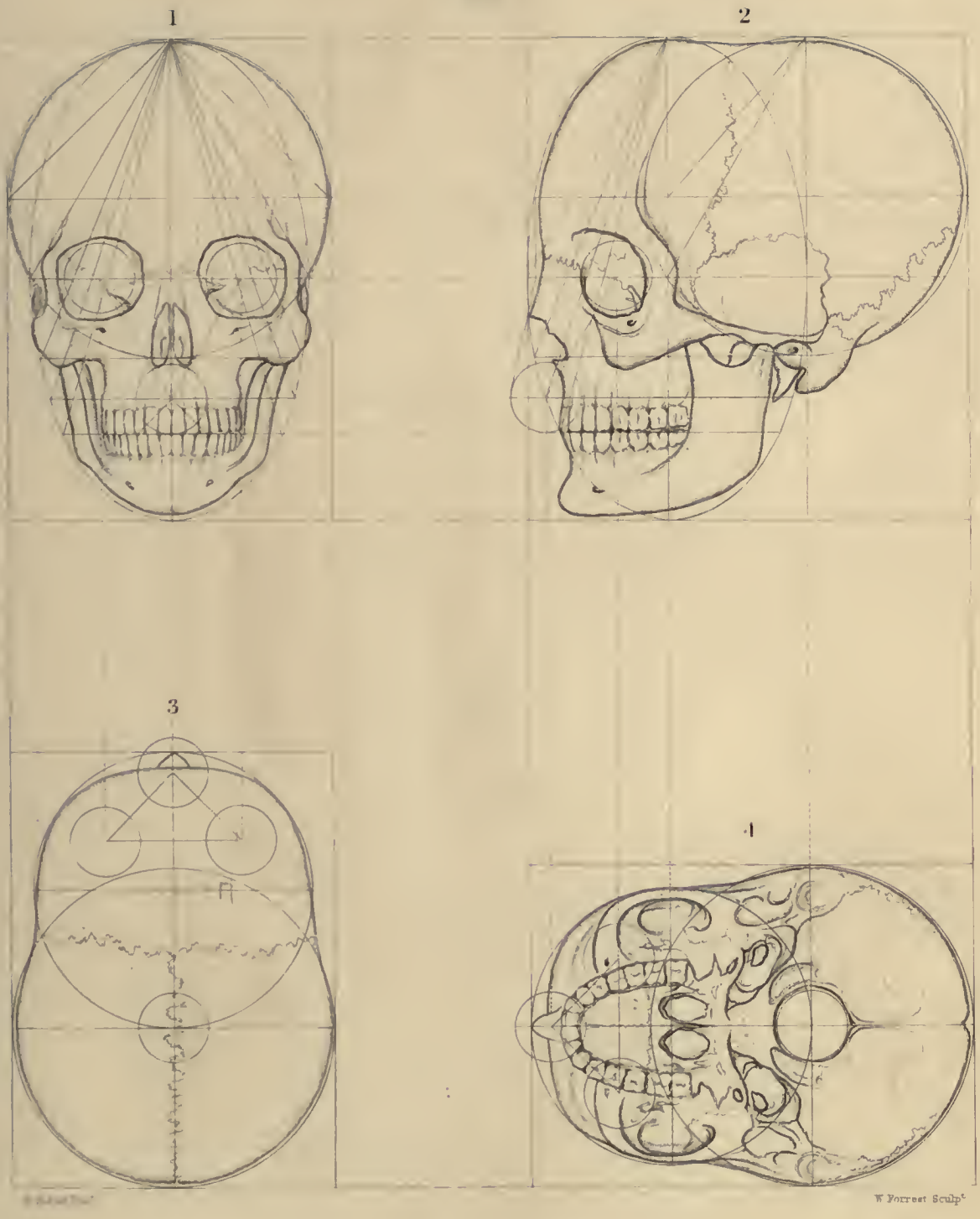

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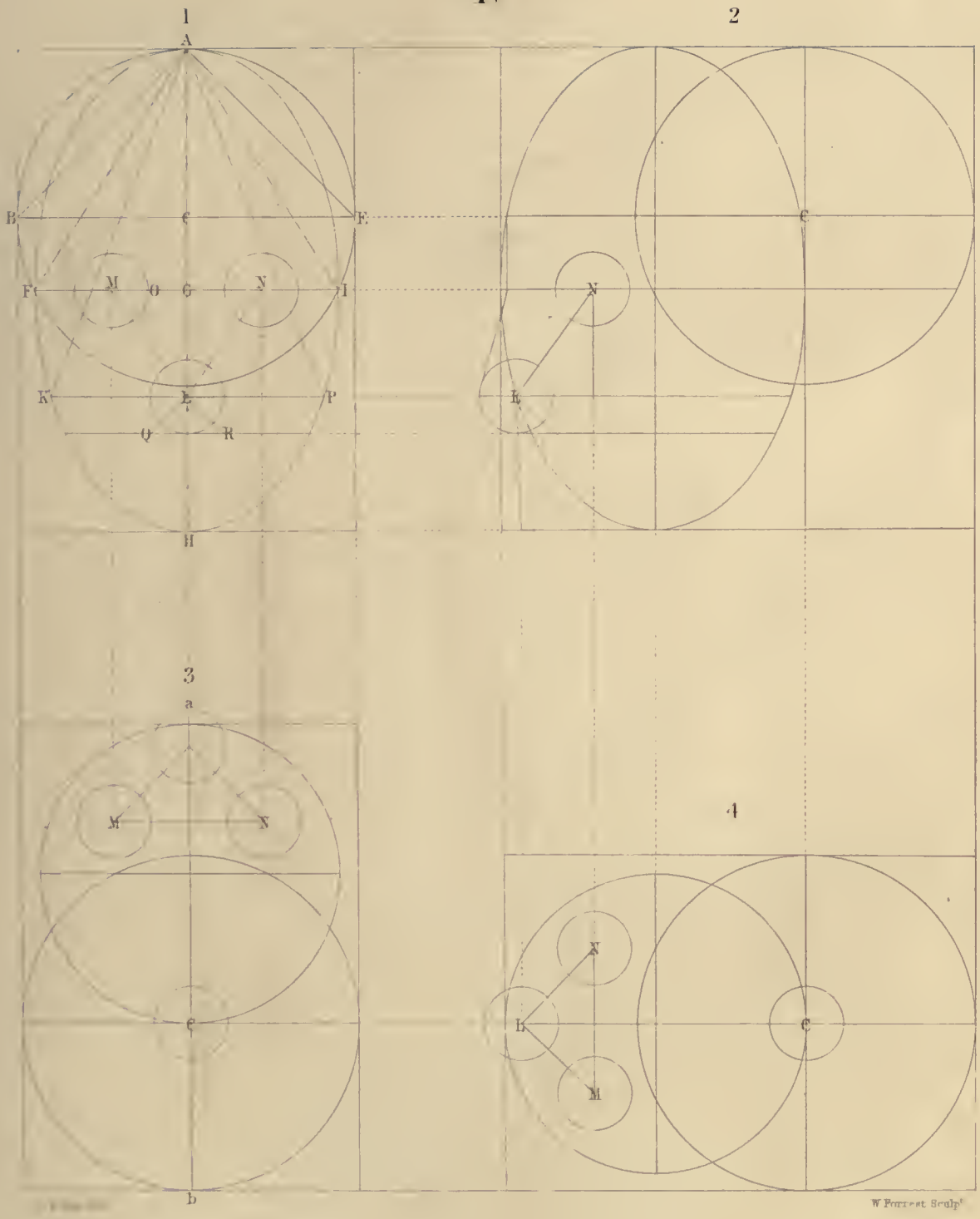

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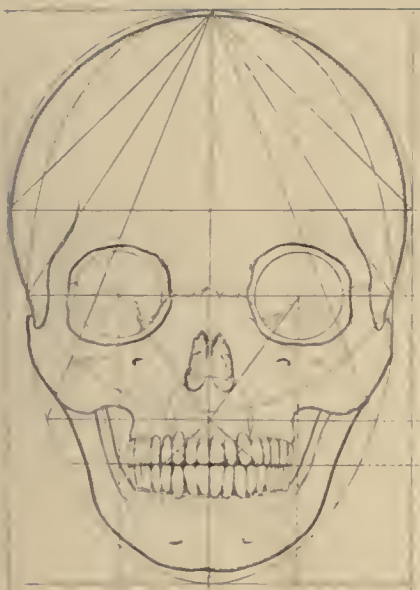

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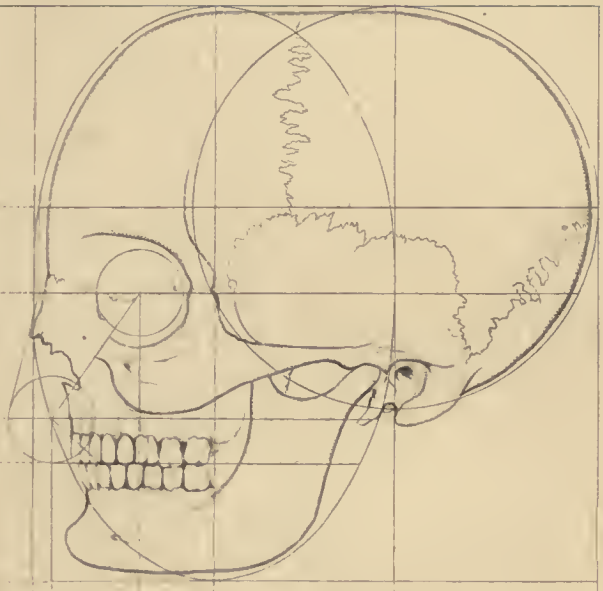

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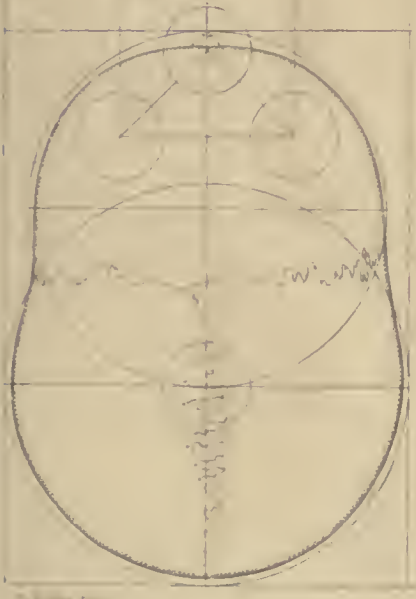

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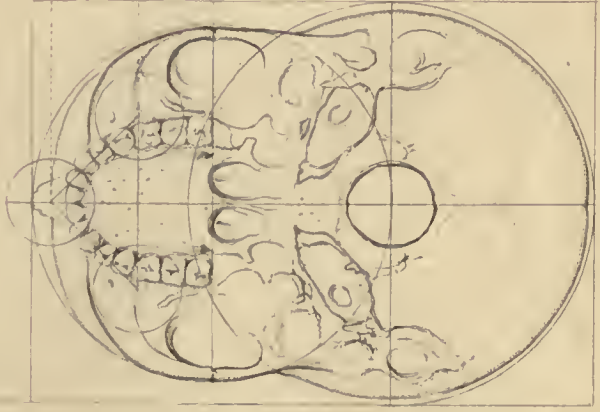

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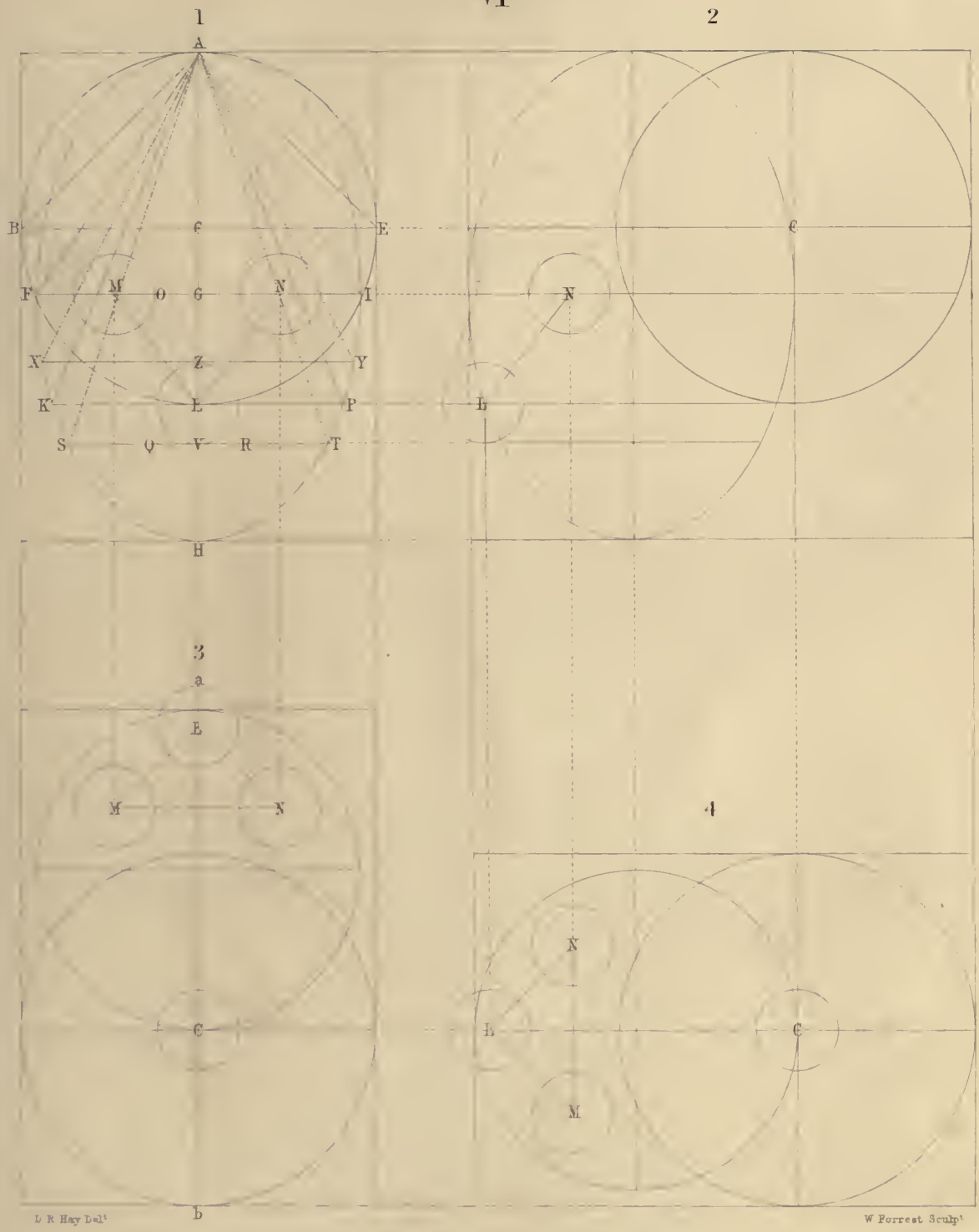

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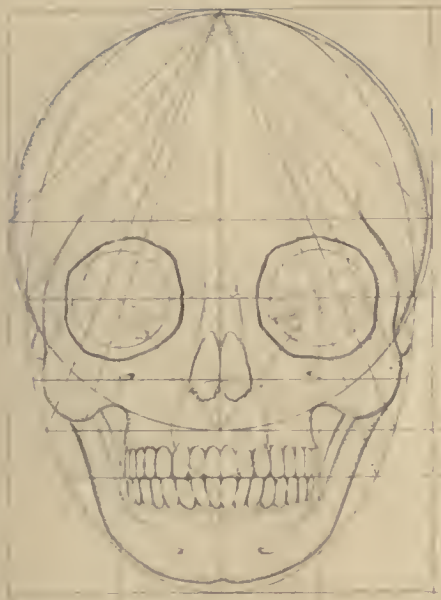

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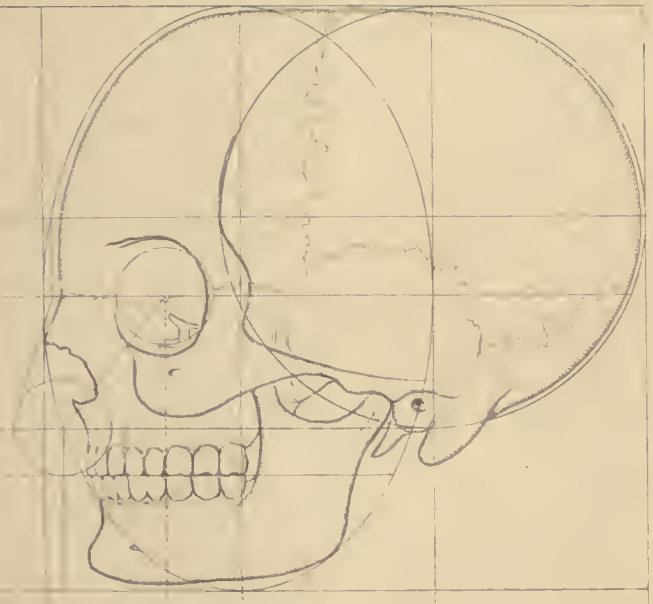

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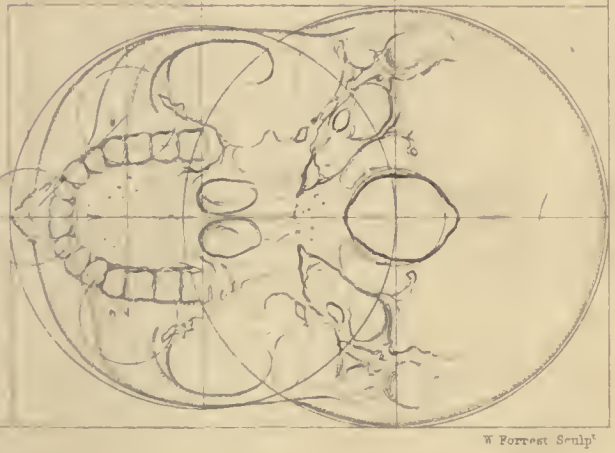

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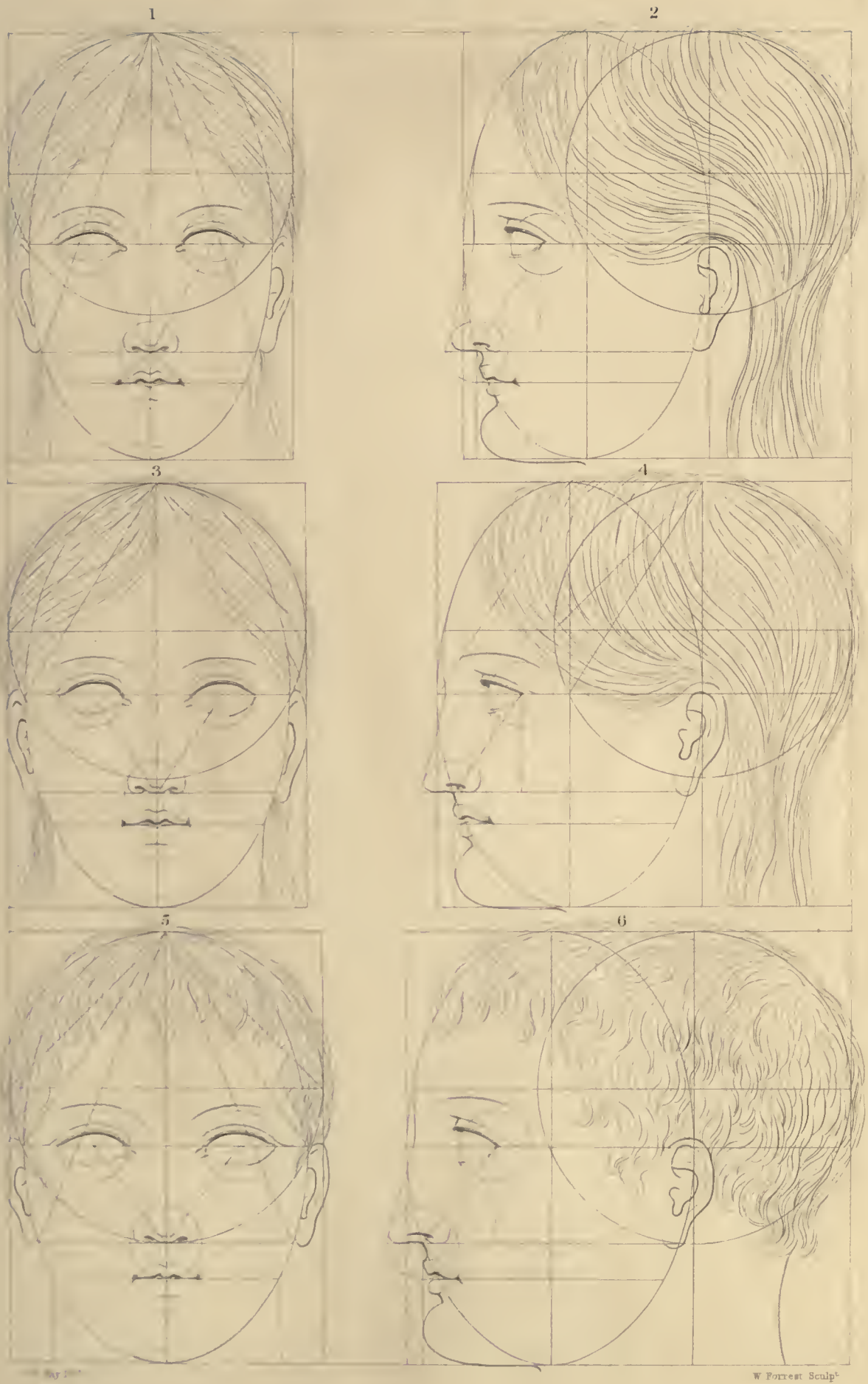

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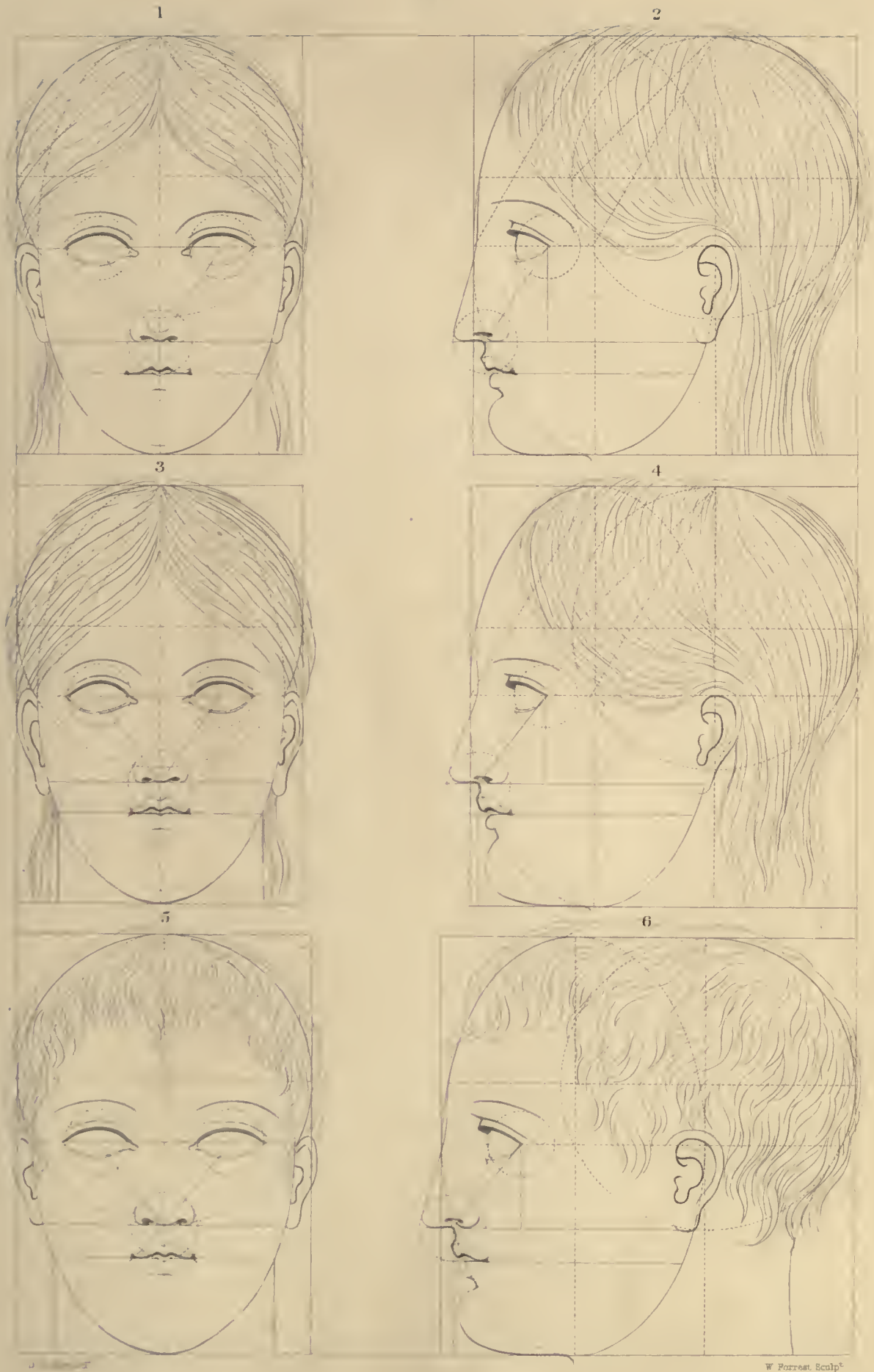
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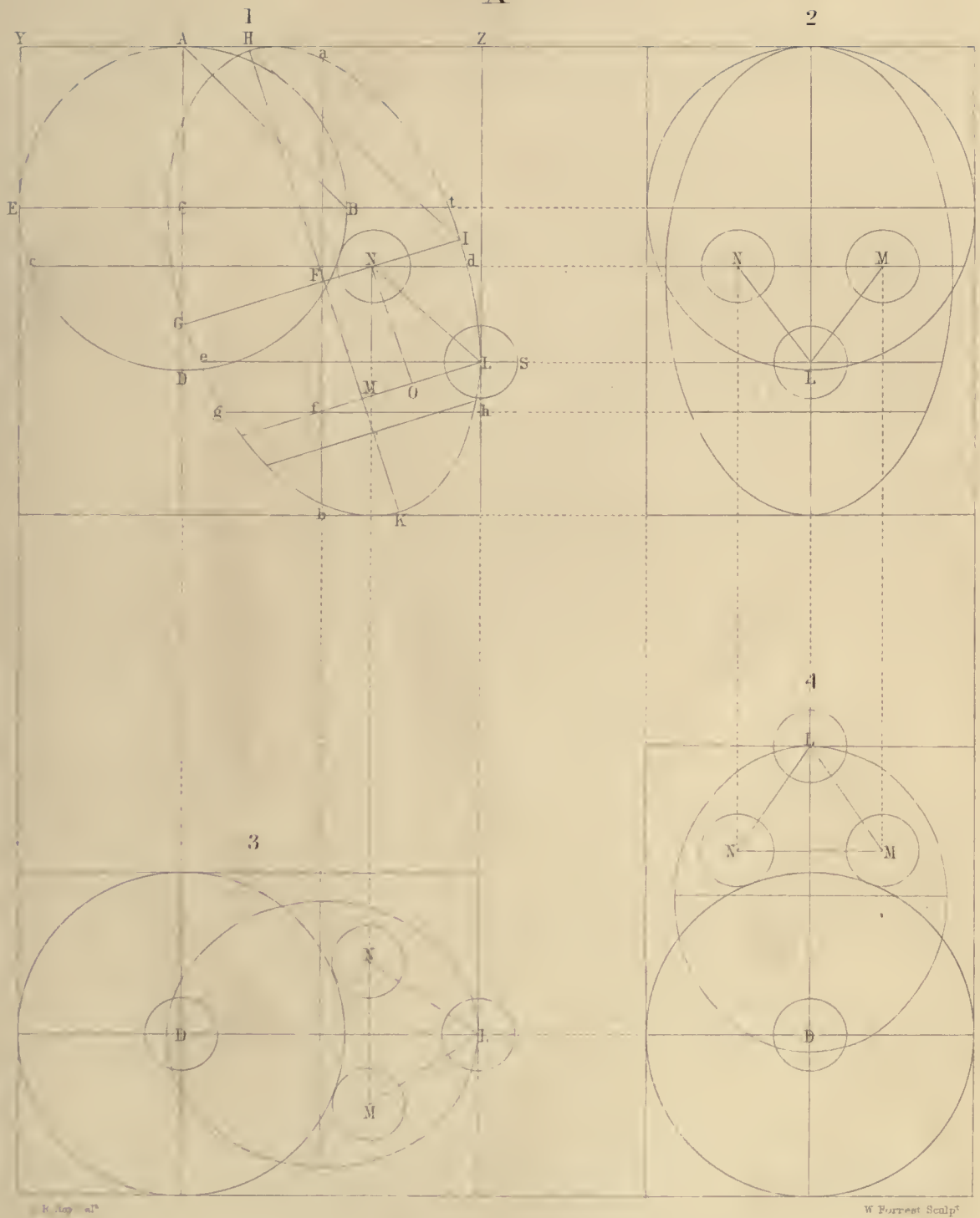
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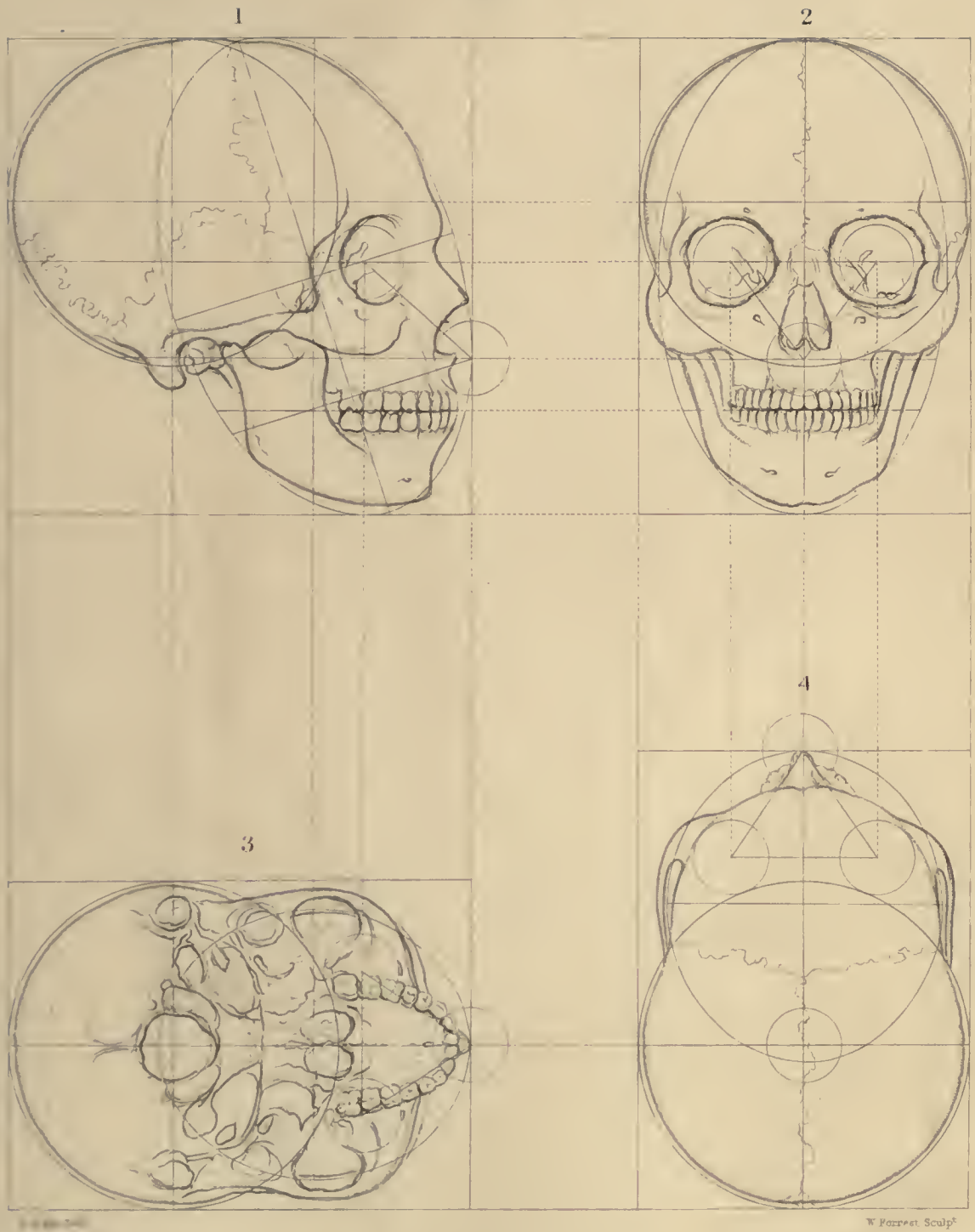

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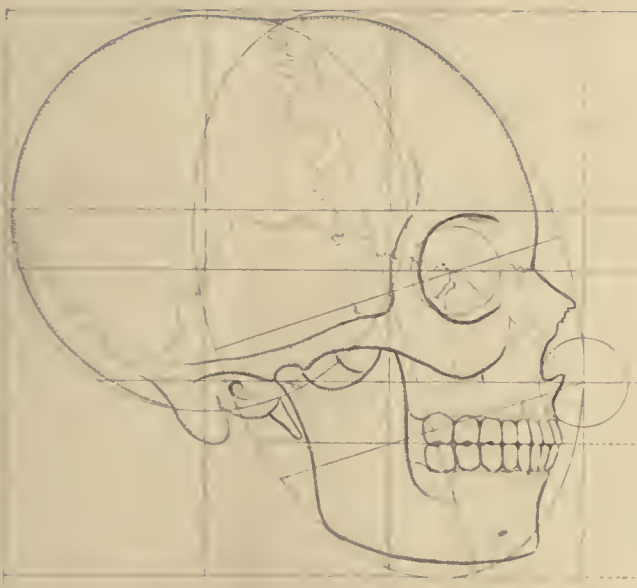

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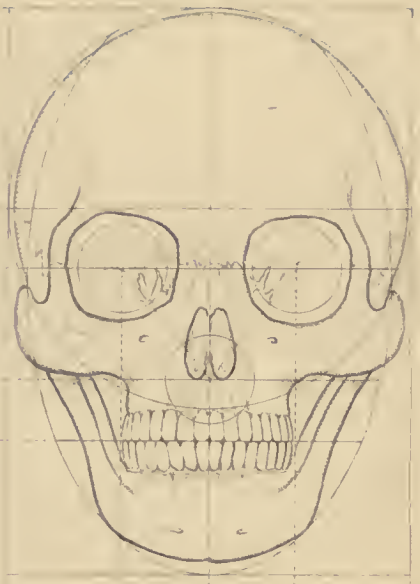

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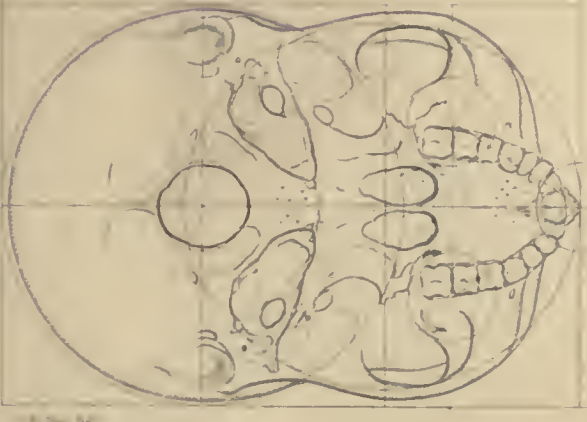

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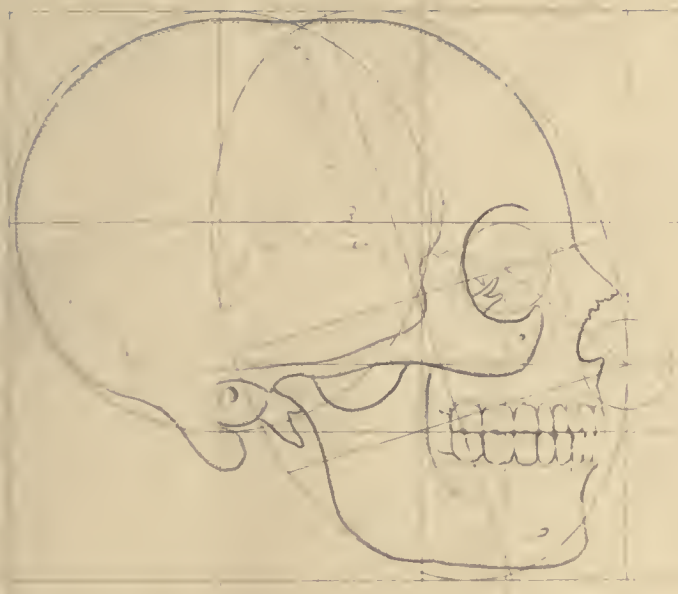

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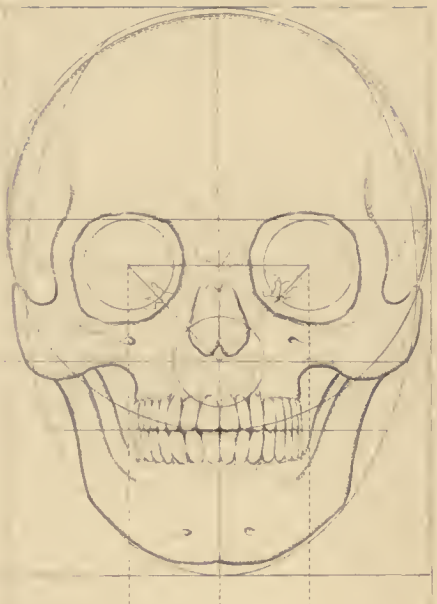

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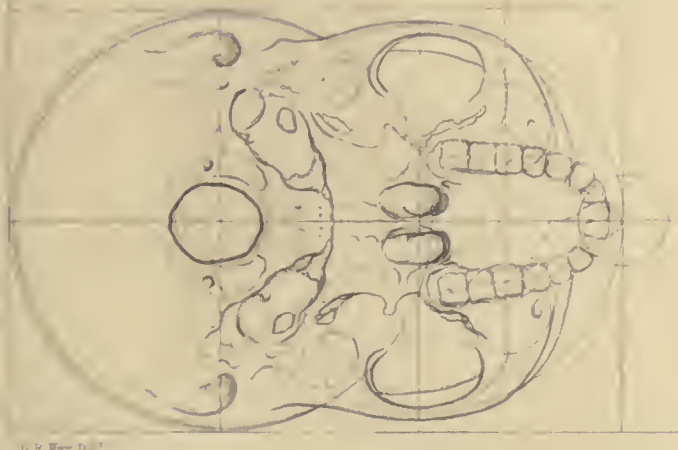

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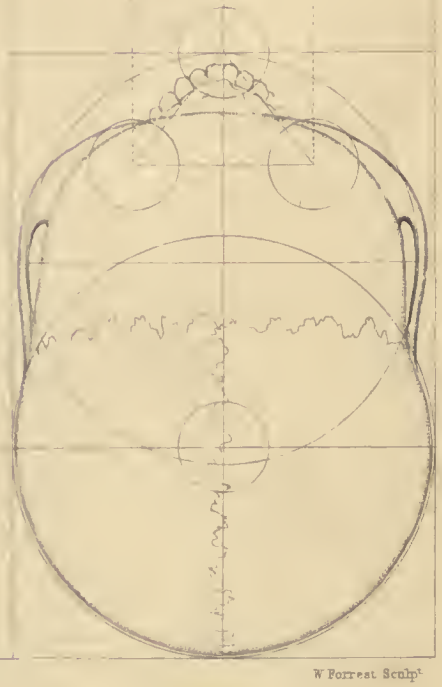

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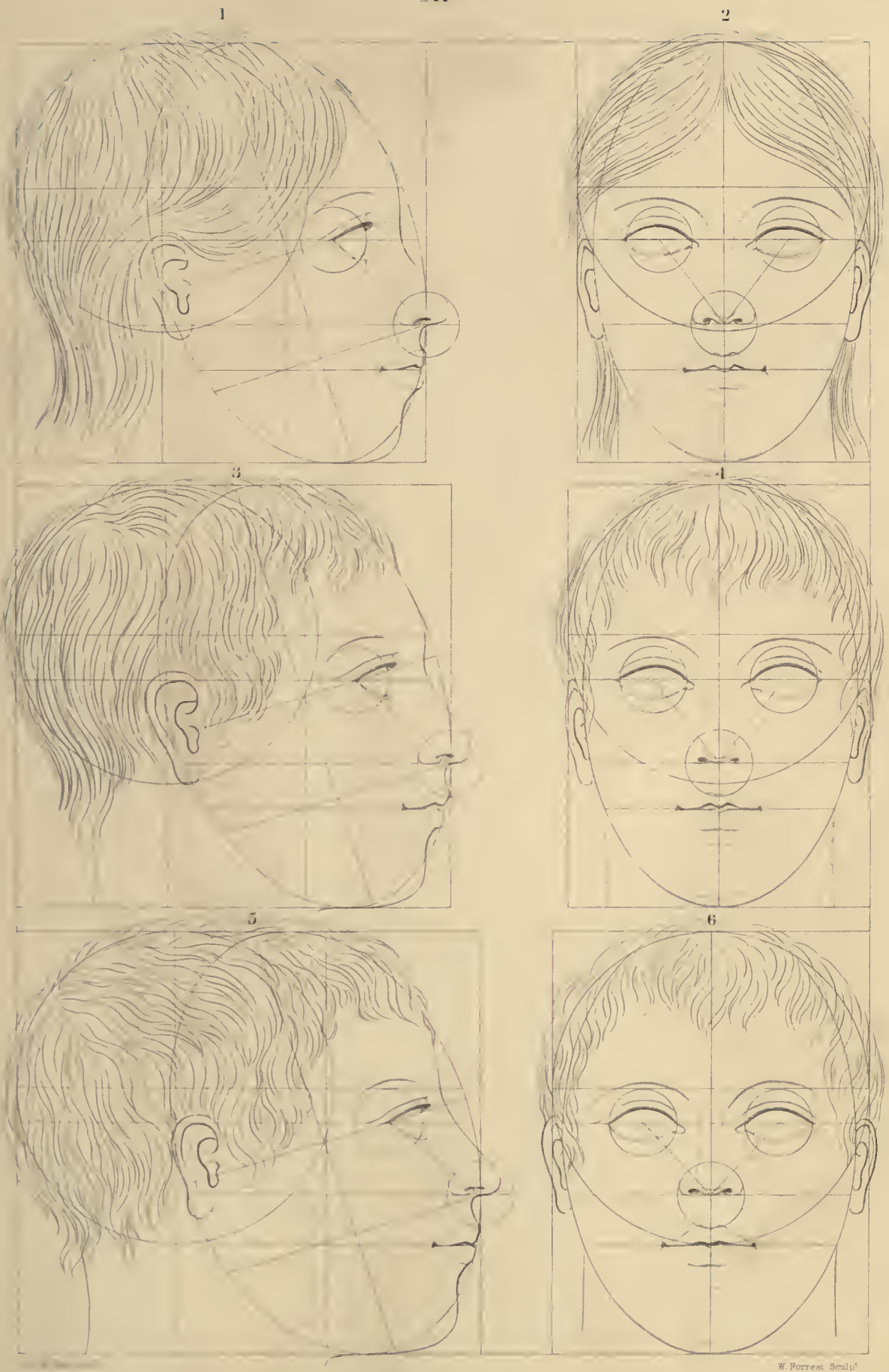
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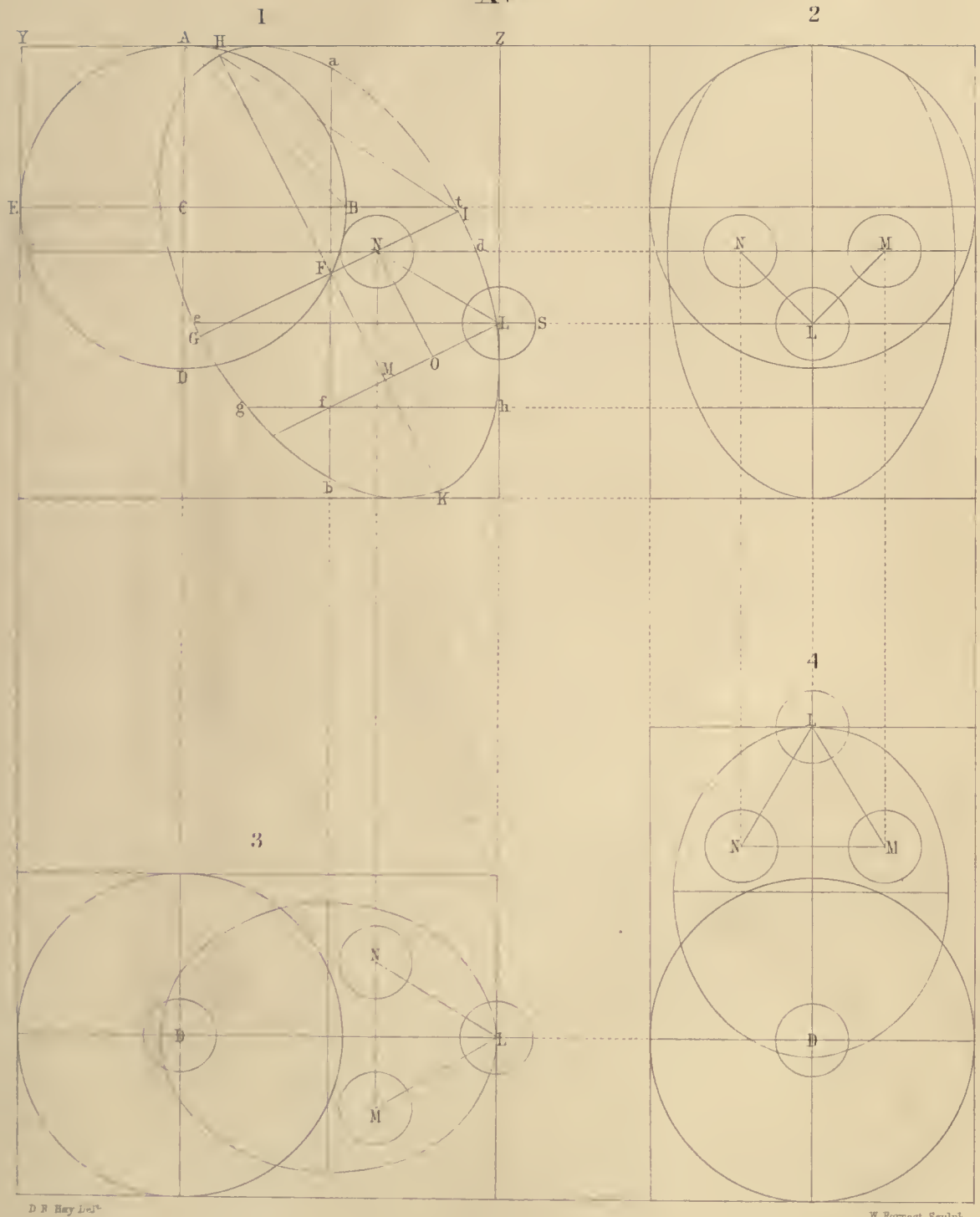
W. Forrest Sculp.

XV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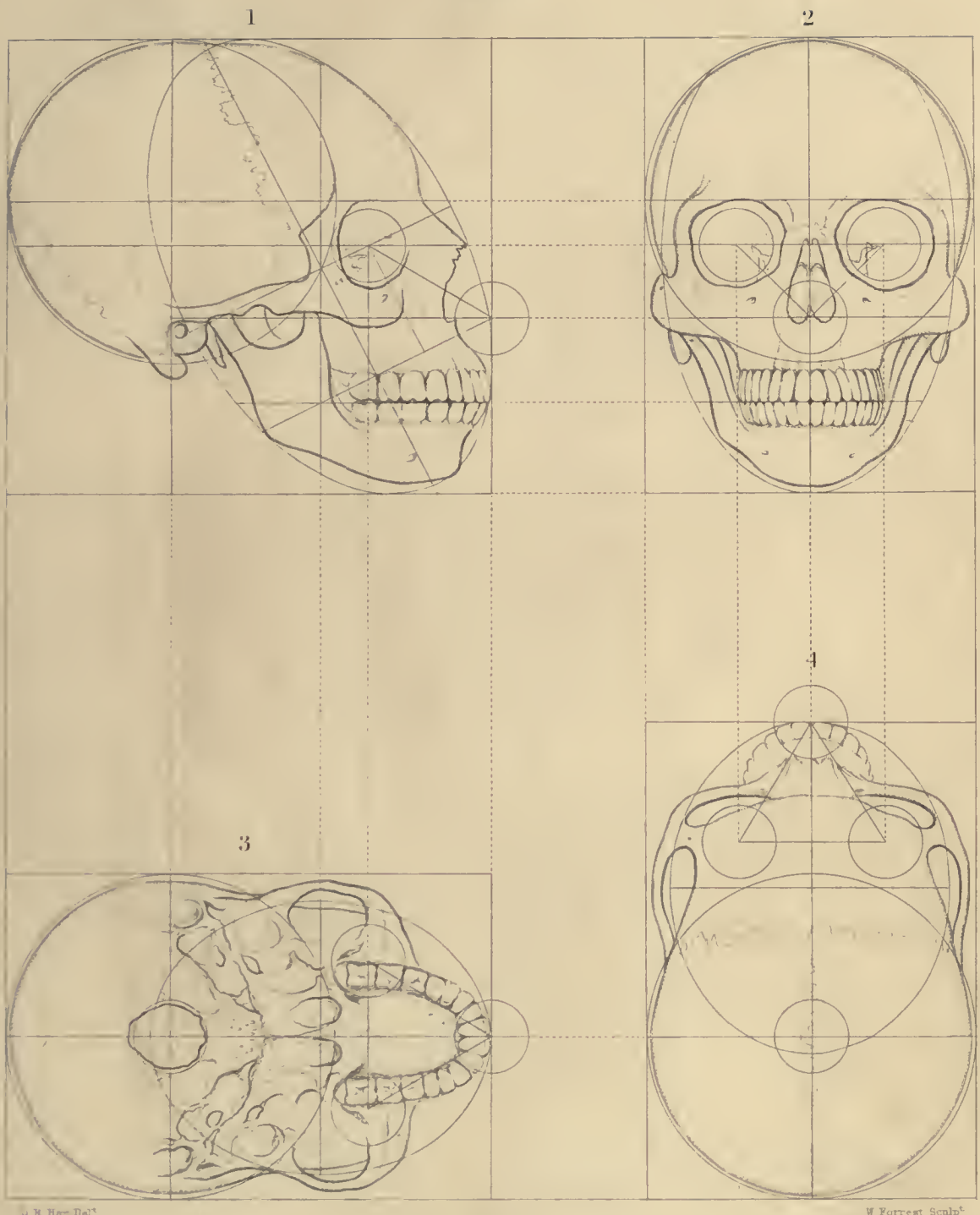
D F Hay Del.t
W Forrest Sculp.t

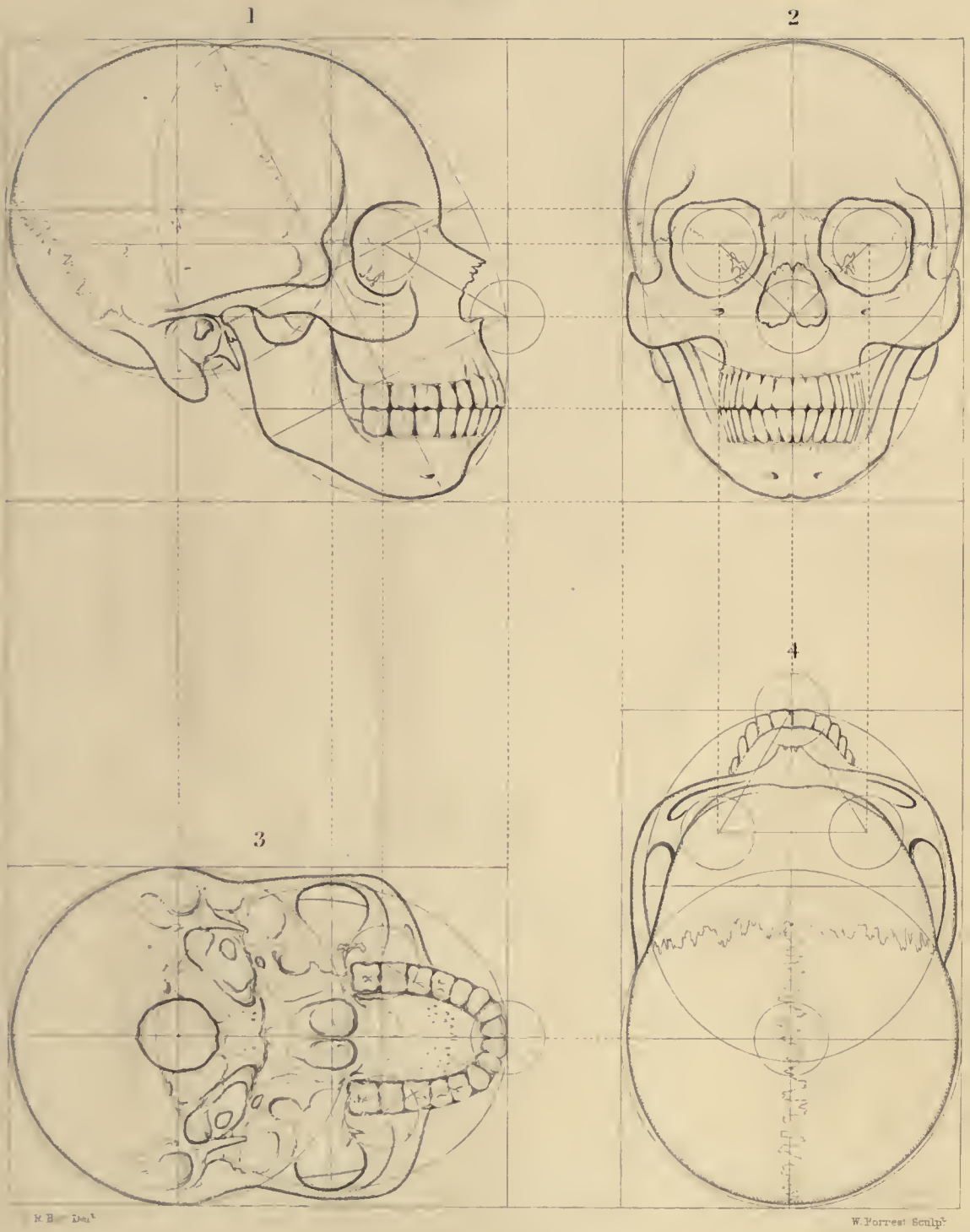
XVI



J. M. Hare Del.ᵗ

W. Forrest Sculp.ᵗ

XVII



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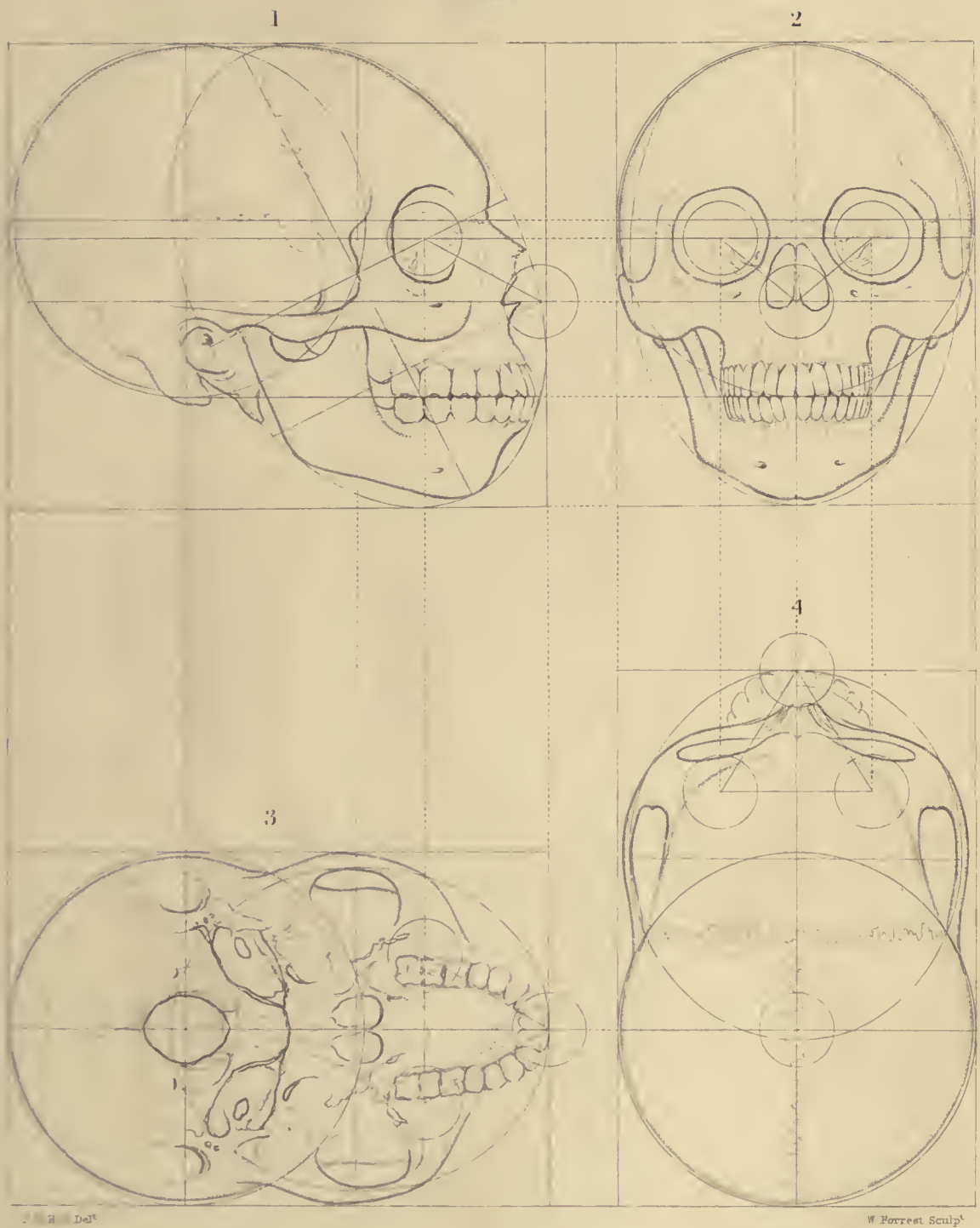

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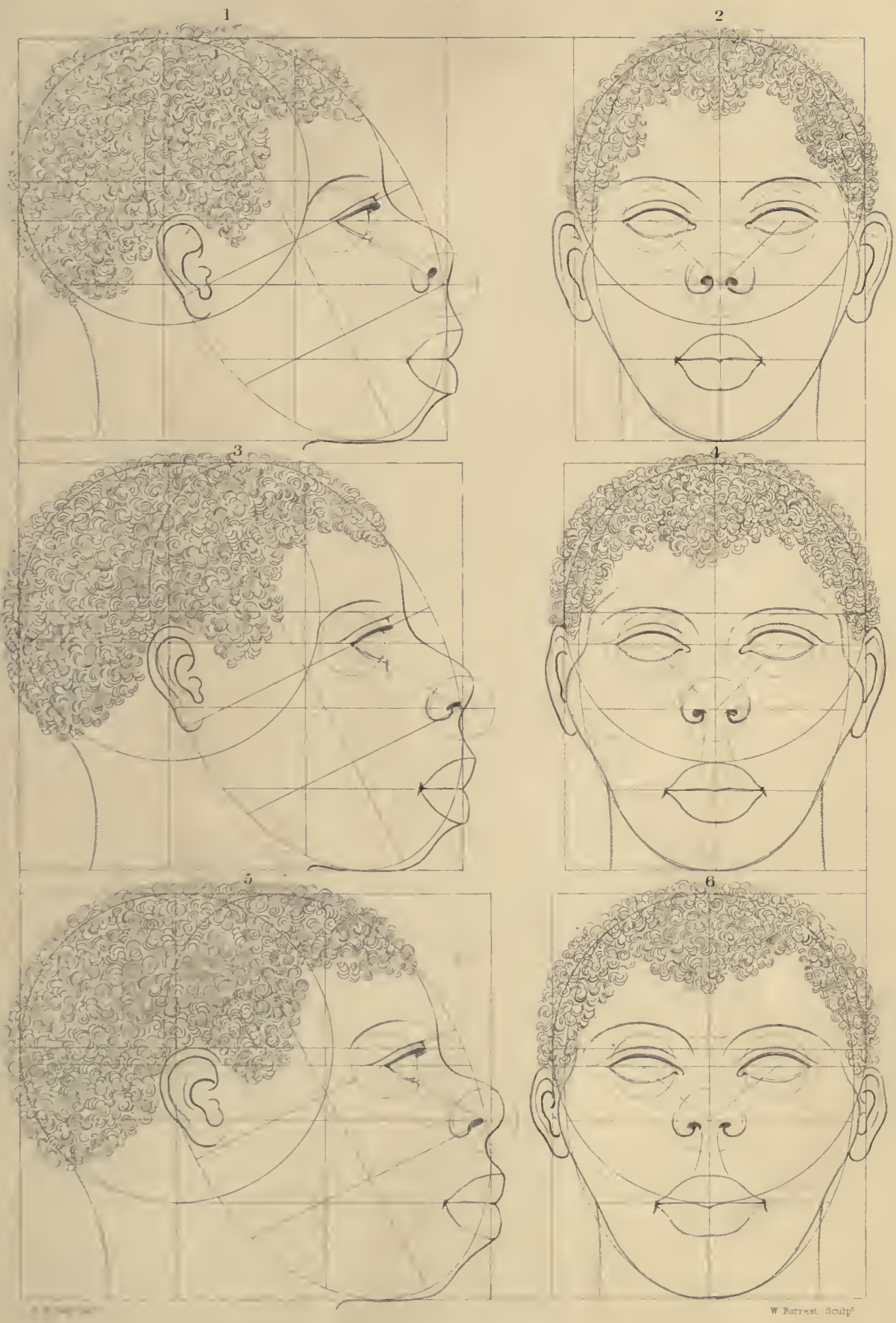
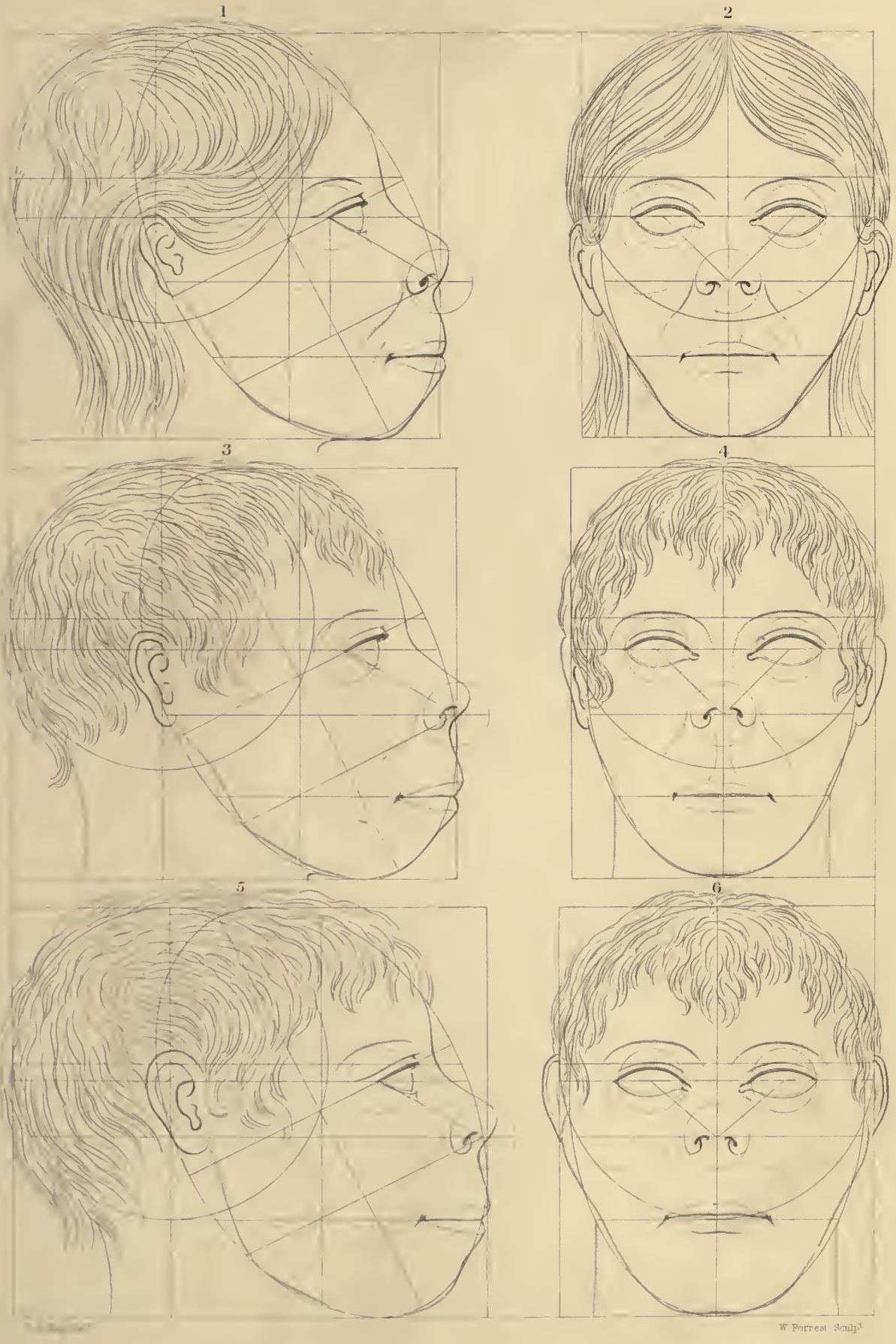
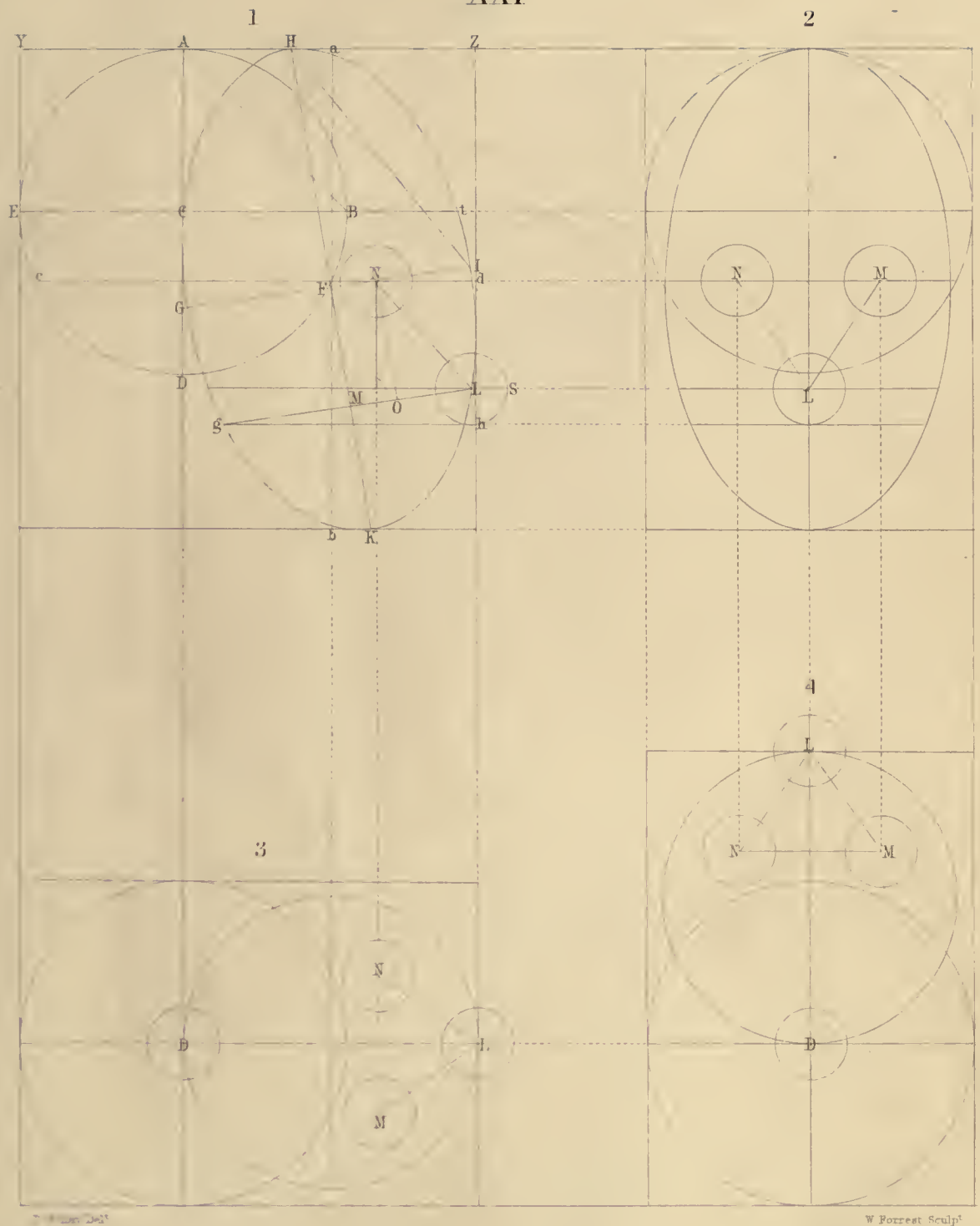




W Forrest Scully.

XXI



W Forrest Sculp.

XXII

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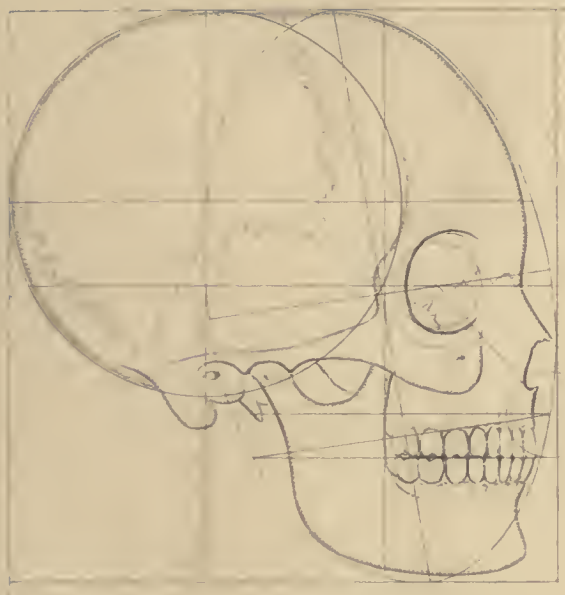

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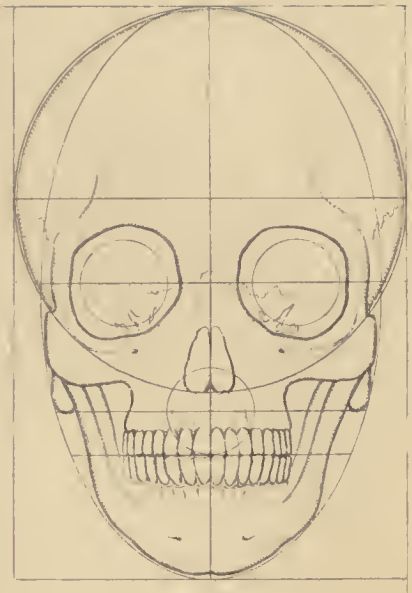

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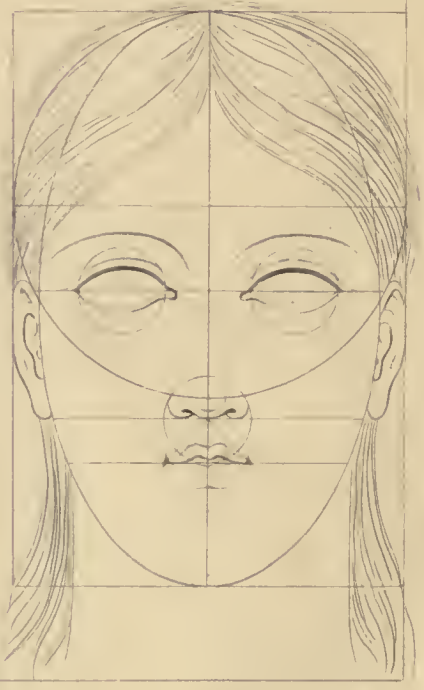
4



W. Forrest. Sculpt.

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R. Hay Del.t

W Forrest. Sculp.t

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W Horrest Sculpt

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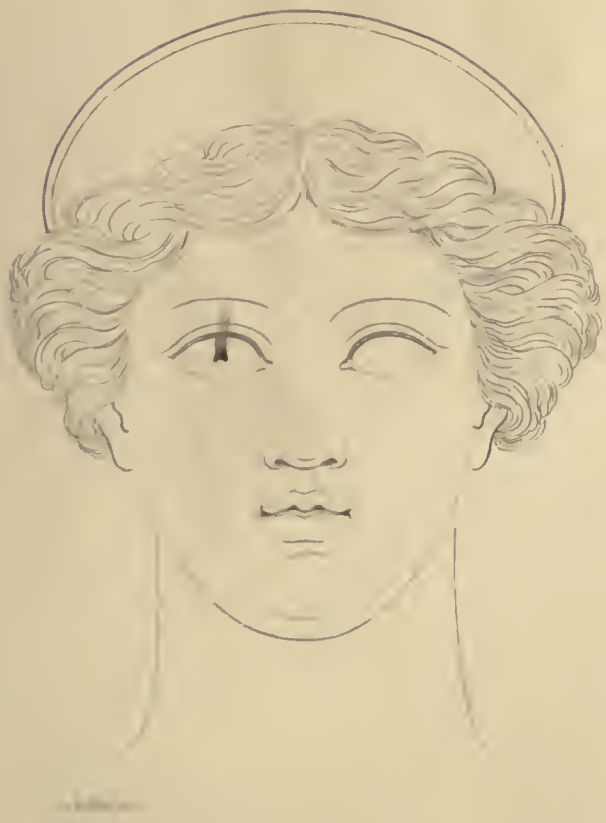

4

W Forrest Sculp.

Hay, David Ramsay
On the science of those proportions by which the human head and countenance, as represented in works of ancient Greek art, are distinguished from those of ordinary nature